Insper

Work Project, presented as part of requirements for the Award of a Master Degree in Economics from NOVA – School of Business and Economics (Portugal) with Double Degree Partnership with INSPER (Brazil)

Bolsa Família Program Impact on the composition of Brazilians families' expenditures

Lauro Américo dos Santos

A project carried out on the Master in Economics Program, under the supervision of:

Priscila Ribeiro (INSPER)

Susana Peralta (NOVA)

2017

ABSTRACT

Bolsa Família Program Impact on the composition of Brazilians families' expenditures

Conditional Cash Transfers Programs are being popular in Latin America as a way to deal with poverty. This work focusses on analyzing how *Bolsa Família* recipients allocate their transfers and if they are spending efficiently to overcoming poverty. We used Propensity Score Matching under the microdata available on the Household Budget Survey 2008-2009 published by IBGE. The main results of this work are an average increase of 10% on food expenditures and an increase of 9.4%, on average, for total expenditures in the 40% poorest quantile, addressing poverty alleviation and ensuring better social conditions.

Keywords: Bolsa Família, Propensity Score Matching, Conditional Cash Transfers

1 Introduction

A simple way of defining poverty is as a condition in which household's income is lower than it is necessary for ensuring their basic living standards. It is most often measured in monetary terms, captured by level of incomes or consumption per capita or per household. One of the most usual thresholds to determine households living in extreme poverty situations is the World Bank US$ 1.90 income per day limit and, in 2013, it was estimated that 767 millions of people were living under this limit, with great reduction in the last 20 years. The World Bank (2016) lists a series of policies implemented throughout several countries considered as effective for this extreme poverty reduction, i.e., investments in rural infrastructure, universal access to health care and good-quality education, taxation and conditional cash transfers (CCT).

In Brazil, the 1988 Constitution adopted after 20 years of dictatorship is a marker for social assistance programs by guaranteeing basic social rights such as free public education, health care and pensions. However, the social security system created was based on formal workers and policies to address poverty focused on old age households and on disability, failing to address child poverty. Furthermore, economic distress that generated high unemployment rates limited the programs' efficiency (The World Bank, 2016, Barrientos *et al*, 2016).

CCT programs became to appear by the end of the 90's, transferring a monthly benefit to families in extreme poverty under the condition that they make specific commitments, i.e., sending children to school and having regular health check-ups. The benefit level depends on the family's demographic composition, i.e., the number of children and elders, gender, and school attendance and performance. The goal for CCTs is to alleviate current poverty while, at the same time, breaking the poverty cycle, conditioning transfers to children's human capital development, thereby increasing their life expectancy, raising social conditions of future generations (Fiszbein, 2009).

One of the largest CCT programs in the world is the Brazilian *Bolsa Família*, implemented by the end of the 90's and in the beginning of the 00's consolidating five different programs throughout the country: *Bolsa Escola*, *Bolsa Alimentação*, *Cartão Alimentação, Auxílio Gás* and *PETI*. The Federal Government, with higher financial and operational capacity, scaled them nationwide, naming it *Bolsa Família*, standardizing eligibility criteria and benefit levels. According to MDS (2017), households with a per capita monthly income up to R$ 85 (US$ 43) are eligible for receiving transfers, while households with a per capita income within a R$ 85 (US$ 43) and R$ 170 (US$ 85) range are only eligible due a specific family structure and with conditions for receiving transfers (expenses in Reais were converted into US dollars using a purchasing power parity bases, PPP 2016: US$ 1 = R$ 1.99). Currently, 25% of the Brazilian population is BF recipient.

Bolsa Família studies are normally related to conditions for participating in the program, i.e., children's school attendance, health check-ups for pregnant women and visits of social assistances and so on. Some studies also focus on the impact on labor supply and in a social inequality index but there are few studies that focus on households' consumption structure.

Since CCTs programs have a complex structure for condition monitoring and benefits levels, involving several government areas with different hierarchical levels, such as Federal, State and Municipal levels, understanding CCT effects on the social and economic development of recipients is important for their success. The objective of this work is to provide an assessment of how *Bolsa Família* recipients address their expenses by analyzing data extracted from an income and expense survey *Pesquisa de Orçamentos Familiares* (POF) collected through 2008-2009 and published in 2010 by IBGE (*Instituto Brasileiro de Geografia e Estatística*, agency responsible for official collection of geographic and statistical data in Brazil), contributing to the literature already available about *Bolsa Família*.

The rest of this work is organized as follows. Section 2 reviews the literature about CCT programs and *Bolsa Família* Program. Section 3 presents the database used for this work and the statistical method that I used in this work. Section 4 presents results and Section 5 summarizes main conclusions.

2 Conditional Cash Transfer Overview and Bolsa Família Program

In this section, I provide an overview about Conditional Cash Transfers (CCT) programs and the *Bolsa Família* Program (BFP). The first subsection presents a literature review about these kinds of programs around the world and their history. The second subsection present a BFP evaluation, its requirements and summarizes some studies already presented about it.

2.1 Conditional Cash Transfers

CCT programs aim to alleviate current poverty while at the same time that ensuring lower future poverty by augmenting human capital levels of children, thus increasing their lifetime earnings potential. Recipient households commit to conditions for receiving benefits, i.e., children's school attendance and family visits to health clinics.

These innovative programs began with Mexican *Oportunidades* and Brazilian *Bolsa Família* in the end of the 90's, as a second-generation type of program for addressing poverty in Latin America.

Oportunidades is recognized as one of the largest and well-designed CCT programs. It originally targeted 300,000 families that lived in extreme poverty in Mexico's rural areas, which expanded for more than 5 million families. Successive waves of data collected to evaluate its impact and the placement of those data in public domain made *Oportunidades* an iconic case of study (Fiszbein, 2009).

In Brazil, *Bolsa Família* was created in 1996, covering 14 million families and is similar to *Oportunidades* in terms of coverage and importance. However, it is softer on conditions and has greater emphasis on income redistribution rather than human capital formation. *Bolsa Família* did not explicitly incorporate impact evaluations in its design and, as a result, much less is known about impacts on consumption, poverty, health, nutrition and education (Fiszbein, 2009, MDS, 2017).

Chile Solidário was created in 2002, focusing on extreme poverty families and reaches 5% of Chile's population. Its design is distinct to other CCT programs, since households work with social workers to understand actions for overcoming extreme poverty, committing to action plans that become the conditions for receiving the benefit. The cash transfer itself is intended to be a motivation for families to make use of the social workers' services for a limited time (Fiszbein, 2009).

Many other CCT programs have spread throughout Latin America and the Caribbean, reaching, in 2010, almost 130 million recipients, representing a quarter of the region's population, distributed in 18 countries (Stampini and Tornarolli, 2012).

Although CCT recipients became relatively less poor, more educated and in some countries engaged in formal wage employment, CCT programs cannot be seen as a "magic bullet" against poverty. Adato and Hoddinott (2007) show that although it can be a great ally to alleviate poverty, the level of expansion that these programs require to benefit millions of families demand great designs and conditional alignments though many government levels and areas, as social development, health and education. Failing to ensure a proper communication between those areas and context the CCT's conditionals to the countries realities are the biggest threats that CCT programs face today. As an example, families in distant and remote areas need to have reasonable access to school and hospital services for them to comply with regular school attendance and medical appointments.

2.2 Bolsa Família Program

Although *Bolsa Família* is considered as the largest CCT in Latin America, it only conditions cash transfer for households within a R$ 85 (US$ 43) and R$ 170 (US$ 85) per capita income/month range. For them, the household's benefits level depends on the family structure as described in Table 1. Households that are in extreme poverty, with less than R$ 85 per capita income/month do not have to comply with conditions to receive benefits. Besides that, benefits are calculated on a case-by-case basis, so they can receive R$ 85 per capita income. Expenses in Reais were converted into US dollars using a purchasing power parity bases, PPP 2016: US$ 1 = R$ 1.99 (Soars *et al.*, 2009) (MDS, 2017).

The entry of households into the *Bolsa Família* Program is done through registration in the *Cadastro Único* system, created in the unification process of the previous benefits that aims to centralize the Brazilian low-income families' socioeconomic records. Until May 2017, according to the Social Development Ministry (MDS, 2017), more than 27.5 million families had been registered, corresponding to almost 80 million people. On these families, 12.7 million have a per capita income up to R$ 85 and 3.8 million between R$ 85 and R$ 170.

The enrollment, however, does not guarantee access to the program, since it depends on the data reported by the families themselves, the program rules, number of families already served in the same municipality in relation to the estimate of families in social vulnerability carried out for the municipalities, in addition to budget constraints. Unlike other comparable CCT programs, *Bolsa Família* Program relies on self-declaration of income rather than statistical indexed or methods to determine eligibility for a family to receive benefits. According to MDS (2017), *Cadastro Único*'s cross-checks information are carried out with other Federal Government's systems to verify any undeclared income. The method, however, is criticized, since it would be more complex to identify income generated by informal activity, considerably high in Brazil.

Table 1 *Bolsa Família* Program variable benefits description

Benefits	Cash Transfer	Conditioning
Households with monthly per capita income lower than R$ 85,00 (US$ 43)		
Overcoming poverty benefit	Calculated on a case-by-case basis to ensure at least R$ 85 income per capita/month.	Not needed.
Households with monthly per capita income within R$ 85,00 – R$ 170,00 (US$ 43 – US$ 85)		
Variable by children from 0 to 15 years old	R$ 39	School attendance of 85% is required.
Variable by Pregnant Benefit	R$ 39 for 9 months	Pregnancy identified and monitored by health area
Breastfeeding Variable Benefit	R$ 39 for 6 months	Children must have data included in Cadastro Único until sixtieth month of life.
Variable by Teenagers from 16 to 17 years old	R$ 46	School attendance of 75% is required.

Source: MDS 2017.

On the other hand, Soares *et. al.* (2010) verified that, although *Bolsa Família* relies on self-declaration income, it has similar targeting performance when compared to other CCT programs in Latin America, such as *Oportunidades* and *Chile Solidário*, both considered international references in terms of focalization and progressivity mechanisms. Stampini and Tornarolli (2012), when comparing eighteen Latin American and Caribbean countries conclude that the Brazilian and Mexican programs are similar in terms of targeting, although they show that programs in Ecuador and Uruguay, even if smaller, show better target indexes. The authors demonstrate that a higher number of recipients means a greater difficulty on targeting households, since it would be much more obvious to identify families in extreme poverty in rural areas, for instance, than families at the poverty line in urban areas. According to Soares *et*

al. (2010), there is a volatility income effect to households at the poverty line that could generate social vulnerability and incentives for the program to continue benefiting households slightly above the limit, as it may occur that withdrawing the benefits, those families could return to poverty and should suffer severe effects on the lag of children in schools, for instance.

According to MDS (2017), conditionality is periodically verified and households that fail to prove children's regular school attendance and immunization schedule are warned that benefits could be suspended. According to Senna *et al.* (2016), 90% of the conditionalities related to education are followed with small variations between municipalities. 75% of health conditionalities, however, are monitored, with strong growth since 2005.

MDS (2017) reports that households are advised to register changes in address, birth or death of family members, increase or decrease in income, among other events as soon as they occur. The main reason that leads families to be disqualified from the program is lack of registration updates or increase in households' income, making them no longer a target by the program. Benefit cancellations due to noncompliance conditions are used only as a last resort, since the program's objective is to reinforce the access of families in need of social rights.

Oliveira *et al.* (2007), comparing recipients and non-recipients with similar income, present positive results regarding children's school enrollment, reducing classes absence and dropout probabilities. The authors also show, however, that children that are *Bolsa Família* recipients are more likely to fail than those who are not, possibly because students who have been out of classes have greater difficulties in following lessons comparing to those who have always attended to school (Soares *et al., 2010*). Jones (2016) reaches similar conclusion, but questions whether the human capital development aspect of the program will be achieved as it is not clear what level of quality and preparation Brazilian schools are offering these students. Barrientos *et al*. (2016) also identified that the program generated different effects on school attendance

depending on gender, with municipalities with less girls attending to school showing stronger attendance effects, as an equalizing effect.

Regarding health-related impacts, Soares *et al.* (2010) concludes that the program has not yet impacted infant immunization rates, despite of its conditionalities. There is no data to conclude whether the number of medical appointments has increased. This effect could be related to the lack of essential health services in municipalities.

Few authors, however, focus their studies on recipient household's consumption expenditure. Resende and Oliveira (2008) analyzed the effects of the *Bolsa Escola* in household spending, comparing consumption patterns between recipient and non-recipient households in the *Pesquisa de Orçamentos Familiares* (POF – Household Budget Survey) 2002-2003. The authors use a matching algorithm based on households' observable characteristics to create a control group, allowing them to obtain a causal estimate of the program. Resende and Oliveira (2008) were able to analyze the program effect on food, housing, clothing, education and other expenses, concluding that recipient families are more likely to improve family's diet, both in quantity and diversification, as well as obtaining items related to children's education, hygiene and health. Consumption of items such as alcoholic beverages, cigarettes and miscellaneous expenses are diminished.

In a more recent work, Sperandio *et al.* (2017) investigated the *Bolsa Família* effects on the participants nutritional quality, based on POF 2008-2009. Food consumption was categorized into 4 kinds: fresh or minimally processed food, culinary ingredients, processed food and ultra-processed food. The authors also used propensity score algorithms to identify valid comparison groups and concluded for a positive effect on the program also on household food security, since the consumption of ultra-processed food increased 1.8 and 1.3 times for those non-recipients by the program in Brazil's Northeast and Southeast regions, respectively.

3 Data and Methodology

In this section I describe the databases and statistical models used in this work.

3.1 Database

This work is based on the microdata from the Household Budget Survey (POF) 2008-2009, published by IBGE. POF is a representative household-based survey, in which household, or consumption unit, is defined as one or more residents who share the same source of food or living expenses.

According to IBGE (2011), the POF's aim is to publish information on expenses, income and wealth evolution of Brazilians families, providing data for studies about domestic budgets and consumers' expenses structure, that are used to measure Brazil's official inflation index, IPCA. POF also provides socioeconomic information such as occupation, types of households, sanitary disposal, water supply and energy, as well as food consumption habits. The survey is conducted every five years, although the most recent research collection started only in 2017, to be available in 2019.

The sample is representative at national level, at large regions level (North, Northeast, Southeast, South and Center-West) and at urban and rural regions level. Detail by federation unit would be representative for the total and urban areas, while details by metropolitan regions and unit federation capitals correspond only to urban areas (IBGE, 2011).

Expenditures data are collected within a year range, but with different collection frequencies (7 days, 30 days, 90 days and 12 months), since smaller values expenses are usually made more often. Income and related information is collected in a 12-month frequency. For comparison purposes, compilation dates were fixed, where all revenues and expenses correspond to January 15th, 2009.

As part of the household income description, POF 2008-2009 distinguishes between monetary and non-monetary income. The first group of income corresponds to income from work (gross remuneration from work as an employee, employer and self-employed), as well as transfers from public and private pensions, pensions and federal social programs, such as *Bolsa Família*, BPC assistance and Child Labor Eradication Program (PETI). It is possible to clearly identify which households receive those transfers and their social conditions, eating habits and consumption patterns.

According to IBGE (2011), for POF 2008-2009 edition, Brazil was divided into 4,696 sectors, corresponding to 55,970 households and 56,091 consumption units. Considering expansion factors provided by IGBE, this research sample represents 57,816,604 households with 190,519,297 persons.

3.2 Propensity Score Matching Estimator

The main challenge in empirical policy evaluation is how to overcome the bias that stems from participant's selection into treatment. Since *Bolsa Família* concentrates its transfers to poor households in a country with high social inequalities, a simple average expenditure comparison between the program's recipients and the rest of the population is not an acceptable approach to evaluate the program's expenditure effect on the poor.

There are several statistical methods that have been created to estimate the causal effect of public policies. This work is based on Propensity Score Matching (PSM), which consists on comparing the treatment group (*Bolsa Família* recipients) with potential households that are not part of the program, but are eligible for it. These comparisons are based on observed characteristics that would match recipients and non-recipients through an estimated probability of program participation. In this way, it is possible to make comparisons between treatment and control groups and analyze their average results (Caliendo and Kopeining, 2008, Cameron and Trivedi, 2005).

To be more precise, let D_i be an indicator variable of whether or not household *i* is a recipient of *Bolsa Família*:

$$D_i = \begin{cases} 1, if\ household\ is\ recipient \\ 0, otherwise \end{cases}$$

Setting as Y_{1i} the outcome variable for household *i* if it is a BF' recipient and Y_{0i} otherwise, the average treatment effect on the treated (ATT) is given by

Equation 1 $$ATT = E[Y_{1i} - Y_{0i}|D_i = 1] = E[Y_{1i}|D_i = 1] - E[Y_{0i}|D_i = 1]$$

Since $E[Y_{0i}|D_i = 1]$ is impossible to observe, since a given household cannot be simultaneously recipient and non-recipient, we need to rely on the outcome of non-recipient households $E[Y_{0i}|D_i = 0]$ as an approximation. However, we need to ensure that the outcomes can be considered equal, i.e., $E[Y_{0i}|D_i = 1] = E[Y_{0i}|D_i = 0]$.

If it were possible to identify non-participant households that are similar to treatment group through a vector (**X**) consisting on observable characteristics and other characteristics that could potentially influence treatment selection, we should have

Equation 2 $$E[Y_{1i} - Y_{0i}|D_i = 1, X] = E[Y_{1i}|D_i = 1, X] - E[Y_{0i}|D_i = 0, X]$$

By constructing an appropriate control group, similar to the treatment one, except in the recipient (or treatment) status, we can assume that the outcomes are independent to the distribution of which group household *i* would be (control or treatment). This way, we can conclude that $(Y_{0i}Y_{1i} \perp D_i)$ according to the Conditional Independence Hypothesis (CIA), leading us to determine that

Equation 3 $$E[Y_{0i}|\, X_i, D_i = 1] = E[Y_{0i}|X_i, D_i = 0]$$

However, it is a great challenge to create a control group which is comparable to treatment group so that the CIA is verified. The propensity score matching method would facilitate this

identification when calculating the probability of a non-recipient household presenting similarity to treatment group given the characteristics vector **X**.

Rosenbaum and Robin (1983) demonstration allows determining that:

Equation 4 $$E[Y_{1i} - Y_{0i}|D_i = 1, P(X)] = E[Y_{1i}|D_i = 1, P(X)] - E[Y_{0i}|D_i = 0, P(X)]$$

It is important to emphasize that two hypotheses are mandatory for an unbiased evaluation: independent households' selection from outcomes and common support between treatment and control groups, i.e., for each recipient household, there's at least one household that has similar probability of being a program participant, considering the characteristics vector **X**. (Rosenbaum and Rubin, 1983) (Cerulli, 2015).

There are several algorithms for matching control and treatment groups, namely, *nearest neighbor* (NN), which can be with or without replacement; *caliper and radius*; *stratification and intervals*; among others (Caliendo and Kopeining, 2008). Sensitivity Analysis is an important step as described by Garrido *et al.* (2014) suggesting balancing analysis between treatment and control groups by comparing standardized differences, distributions graphs and variance ratios, especially for confounders hypothesized to be strongly related to the outcome.

In this work, we calculated propensity score through a probit model considering the characteristics vector **X** and used this as an input for a propensity score estimator. In this method, each treated household is paired with one household in control group who has the nearest propensity score. I made balancing analysis through standardized differences, balance graphs and propensity score box plots.

3.3 Data and variables description

Based on microdata available by IBGE in POF 2008-2009, files containing information about domiciles, socioeconomic conditions, individuals, expense and income were merged into a unified database summarized by consumer unit. Based on this, 9,268 households were identified as recipients of *Bolsa Família*, corresponding to 16.32% of the total sample of 56.091

households. Excluding the income of the program, these families receive monthly, on average, R$ 167.44 per capita.

According to MDS (2017), by the time of the survey, *Bolsa Família* target population were families within poverty range (per capita income per month of R$ 77.01 to R$ 154, as long these families include children, teenagers, pregnant women and breastfeeding women) and extreme poverty range (per capita income per month below R$ 77, considering any family structure).

Table 2 Dependent variables description

Monetary expenditures	**Description**
Food	Food acquisition for both inside and outside consumption.
Clothing	Men's, women's, children's clothes, footwear, jewelry, fabrics and haberdashery.
Education	Regular courses, higher education, textbooks, school articles and other related expenses.
Housing, Transportation, Hygiene and Health Care	Housing expenditures account for rent, services as telephone, water, gas, electricity, house maintenance, furniture and repairs. Transportation expenditures account for urban transportation, vehicles acquisition and maintenance, sporadic trips among other related items. Hygiene expenditures account for perfumes, hair products, soap and other instruments and products for personal use. Health Care expenditures account for medicines, health plans, medical and dental treatments, surgeries, hospitalizations, among other related expenses.
Other items	Toys, games, cell phones and accessories, non-didactic books and magazines, cigarettes and tobacco, personal services i.e., hairdressing, manicure and pedicure services; taxes, labor contributions, banking services, pensions, allowances and donations.
Total Expenditures	Sum of the expenditures above.

Source: Household Budget Survey – POF 2008-2009/IBGE. Self-Elaboration.

I considered as dependent variables monetary expenditures on food, clothing, education, aggregated monetary expenditures on housing, transportation, hygiene and health care; and other items. Each categories description is further detailed in Table 2.

Average expenses decomposition for BF recipients is available in Figure 1. Food expenditures account for 33% of total expenses budget as the largest household's expenditure, followed by Housing (23%), Transportation (15%), Clothing (7%), Health Care (5%) and Hygiene and Personal Items (4%).

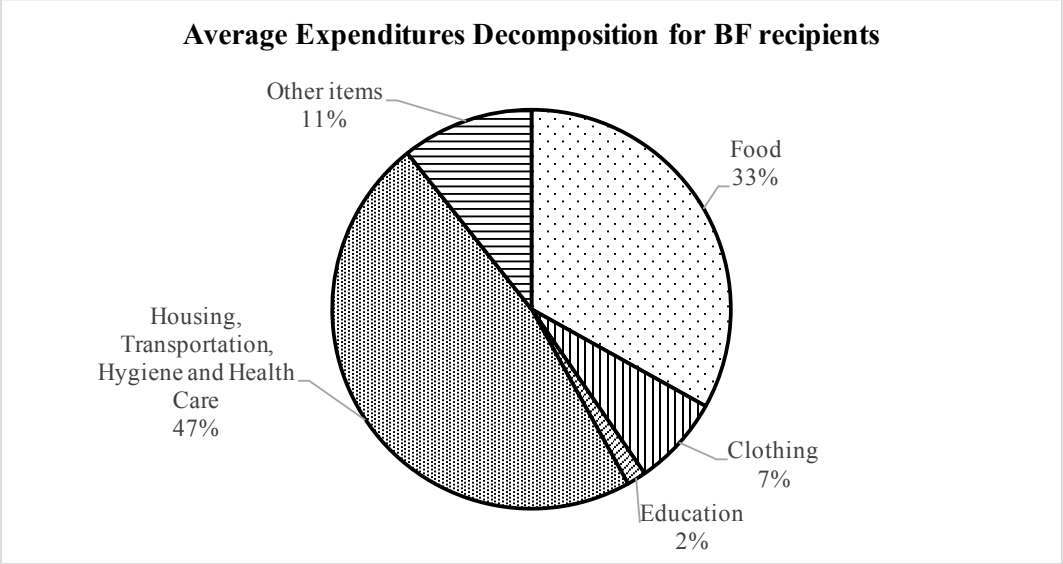


Figure 1 Average expenditures decomposition for BF recipients.

Source: Household Budget Survey – POF 2008-2009/IBGE. Self-Elaboration.

To meet propensity score matching model requirements, I used observable households' characteristics as independent variables considering the *Bolsa Família* selection model itself and sample distributions of other observable characteristics among control and treatment group. Examples of independent variables are income per capita without the transfers, urban or rural location indicator, a set of variables indicating the materials in which the domiciles were built and what kind of public services are available. Information about the head of the consumer units and family structure was also considered.

The next session displays the results of the estimated models.

4 Results

Independent variables descriptive analysis for raw data, before any match was been done is available in Table 3. Since *Bolsa Família* has two target population range, I analyzed the program effects for the 40% and 20% poorest quantiles as well.

The 20% poorest quantile has an average income per capita without BF transfers of R$ 93.05 for total subsample and R$ 79.88 for BF's recipients. This quantile recipients correspond to 48.7% of total subsample. We can approximate this quantile to the BF's extreme poverty range (below R$ 77 per capita income/month).

The 40% poorest quantile has an average income per capita without any BF transfer of R$ 165.55 for total subsample and R$ 121.46 for BF's recipients. This quantile recipients represent 35.9% of total subsample and corresponds to 86.9% from all recipients in the survey. It is important to mention that restricting the number of observations can affect the quality of the estimates, specially for the 20% poorest quantile.

Propensity scores matching models for all expenditures and subsamples are based on the nearest neighbor with replacement technique as an attempt to overcome this issue.

Infrastructure, social and health conditions in which BF's households are located are more vulnerable, with a lower rate of garbage collection, piped water, street paving and connection to sewer networks; naturally, this becomes even lower when we concentrate on the 40% and 20% poorest quantiles. BF's recipients have also shown a higher number of children and less years of education for the consumer units' head.

These remarks are also verified when we analyze the probit regression results, available in Table 4, for checking the reasonableness of the propensity score calculation and as a characterization of the determinants of being a recipient.

Table 3 Independent variables descriptive statistics for raw data

	Total				40% Poorest				20% Poorest			
	Non-recipients		Recipients		Non-recipients		Recipients		Non-recipients		Recipients	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Households data												
Located at urban area	79.7%	40.3%	64.7%	47.8%	73.9%	43.9%	63.0%	48.3%	69.4%	46.1%	58.7%	49.2%
External wall made from masonry	87.7%	32.9%	80.3%	39.8%	82.4%	38.1%	79.4%	40.5%	77.5%	41.8%	76.3%	42.5%
Cover made of tile	79.4%	40.5%	89.8%	30.3%	84.6%	36.1%	90.0%	30.0%	84.7%	36.0%	89.8%	30.2%
Floors made of cement	30.5%	46.1%	59.2%	49.1%	44.1%	49.6%	60.4%	48.9%	50.2%	50.0%	62.1%	48.5%
Existence of piped water	92.6%	26.2%	75.6%	43.0%	86.5%	34.2%	74.0%	43.9%	80.0%	40.0%	69.0%	46.3%
Connection to sewer network	40.3%	49.0%	18.0%	38.4%	29.0%	45.4%	16.6%	37.2%	24.3%	42.9%	14.0%	34.7%
Paved street	64.1%	48.0%	41.6%	49.3%	52.6%	49.9%	39.7%	48.9%	46.4%	49.9%	35.5%	47.9%
Mail is delivered by postman	76.5%	42.4%	58.2%	49.3%	68.7%	46.4%	56.5%	49.6%	63.8%	48.1%	51.7%	50.0%
Garbage collected daily	77.6%	41.7%	58.3%	49.3%	70.5%	45.6%	56.2%	49.6%	65.1%	47.7%	51.4%	50.0%
Water heating	59.7%	49.1%	24.5%	43.0%	44.3%	49.7%	22.6%	41.9%	36.2%	48.1%	18.8%	39.0%
Residents data												
Income per capita without BF transfers (R$/month)	778.11	1,392.44	167.84	224.77	190.23	105.98	121.46	87.94	105.53	60.74	79.88	54.28
Number of children until 15 years old	0.75	1.01	2.03	1.46	1.48	1.21	2.22	1.44	1.93	1.41	2.59	1.50
Years of education for the consumer unit head	6.66	4.68	3.99	3.50	5.24	3.93	3.80	3.36	4.59	3.75	3.42	3.17
Checking account for consumer unit head	20.2%	40.1%	3.0%	17.0%	6.7%	25.0%	2.2%	14.6%	3.8%	19.1%	1.3%	11.3%
Number of observations	**46,823**		**9,268**		**14,386**		**8,051**		**5,760**		**5,459**	

Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 4 Propensity score probit regression for total expenditures model

	Total		40% Poorest		20% Poorest	
	Coef. (Std. Err.)	**95% CI**	**Coef. (Std. Err.)**	**95% CI**	**Coef. (Std. Err.)**	**95% CI**
Households data						
Located at urban area	0.03 (0.0269)	[-0.02; 0.09]	0.00 (0.0315)	[-0.06; 0.06]	-0.01 (0.0415)	[-0.09; 0.08]
External wall made from masonry	0.12* (0.0227)	[0.07; 0.16]	0.14* (0.0264)	[0.09; 0.19]	0.15* (0.0343)	[0.08; 0.21]
Cover made of tile	0.13* (0.0249)	[0.08; 0.18]	0.15* (0.0306)	[0.09; 0.21]	0.20* (0.0417)	[0.12; 0.29]
Floors made of cement	0.20* (0.0169)	[0.17; 0.24]	0.18* (0.0203)	[0.14; 0.22]	0.16* (0.0280)	[0.10; 0.21]
Existence of piped water	-0.01 (0.0251)	[-0.06; 0.04]	0.00 (0.0287)	[-0.06; 0.06]	0.02 (0.0362)	[-0.05; 0.10]
Connection to sewer network	-0.06* (0.0209)	[-0.10; -0.02]	-0.07* (0.0262)	[-0.12; -0.02]	-0.09** (0.0375)	[-0.16; -0.01]
Paved street	-0.02 (0.0198)	[-0.06; 0.02]	0.00 (0.0237)	[-0.05; 0.04]	0.00 (0.0323)	[-0.06; 0.06]
Mail is delivered by postman	-0.05*** (0.0259)	[-0.10; 0.00]	-0.03 (0.0304)	[-0.09; 0.03]	-0.08** (0.0404)	[-0.16; -0.01]
Garbage collected daily	-0.06** (0.0235)	[-0.10; -0.01]	-0.10* (0.0276)	[-0.15; -0.05]	-0.11* (0.0366)	[-0.19; -0.04]
Water heating	-0.36* (0.0181)	[-0.39; -0.32]	-0.36* (0.0223)	[-0.41; -0.32]	-0.37* (0.0318)	[-0.43; -0.31]
Residents data						
Income per capita without BF transfers (R$/month)	-0.45* (0.0093)	[-0.47; -0.44]	-0.32* (0.0120)	[-0.34; -0.29]	-0.25* (0.0161)	[-0.28; -0.22]
Number of children until 15 years old	0.30* (0.0065)	[0.29; 0.31]	0.23* (0.0072)	[0.22; 0.25]	0.21* (0.0089)	[0.19; 0.22]
Years of education for the consumer unit head	-0.03* (0.0021)	[-0.03; -0.03]	-0.04* (0.0027)	[-0.04; -0.03]	-0.04* (0.0038)	[-0.05; -0.03]
Checking account for consumer unit head	-0.21* (0.0340)	[-0.27; -0.14]	-0.24* (0.0500)	[-0.34; -0.15]	-0.33* (0.0877)	[-0.50; -0.16]
Number of Observations	**55,350**		**21,884**		**10,760**	
Pseudo R2	**0.32**		**0.15**		**0.11**	

Source: Author's computation using data from the Household Budget Survey – POF 2008-2009/IBGE.
Significance Level: (* 1%) (** 5%) (*** 10%)

Propensity score matching models' results are available in Table 5. I compared three models in this work to analyze their robustness and respective Average Treatment Effect on the Treated (ATT) through subsamples. Robust standard errors are presented according to Abadie and Imbens (2016) model.

As propensity score matching model requires that there is a common support region between treatment and control groups, Figure 2 shows that all models calculated in this work comply

with this requirement. As balance test for all covariates in the three models, average standardized differences for matched observations is shown in Table 6 and variance ratios for matched observation in shown in Table 7. Covariates balancing graphs are also available in the Appendix section.

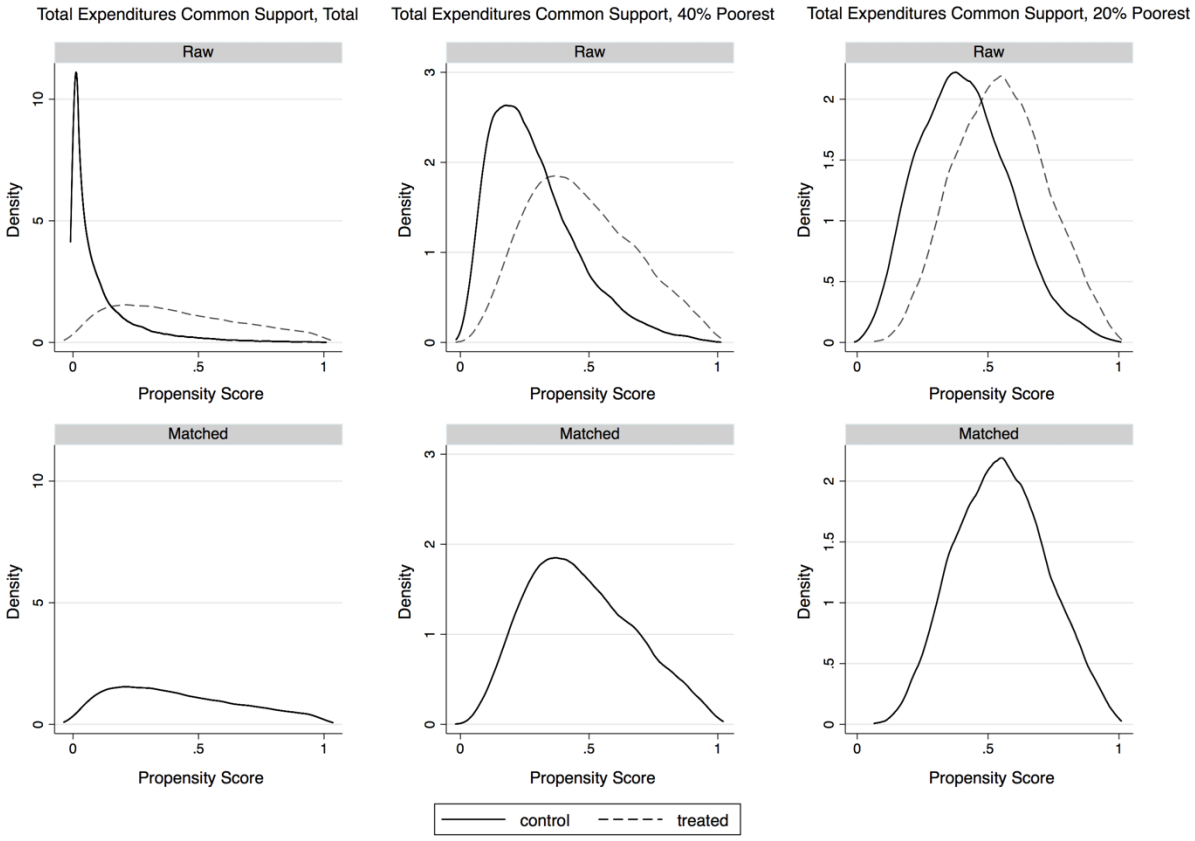


Figure 2 Total expenditures common support for total, 40% and 20% poorest subsamples

Source: Author's computation using data from the Household Budget Survey – POF 2008-2009/IBGE.

Food expenses raised, on average, by 10.8%, 10.0% and 10.3% for the entire sample, 40% and 20% poorest subsamples, respectively. The rise of expenses on food equates to results found by Resende and Oliveira (2008) when analyzing the effects of *Bolsa Escola* transfers on households' budget expenditures using POF 2002-2003 microdata.

Clothing expenditures raised, on average, by 5.7% for total households and 7.3% for 40% poorest households and 70% for 20% poorest household subsample.

Housing, Transportation, Hygiene and Health Care expenses are considered as a single expense account, to overcome issues of mismeasurement in individual terms. On average, this group expenditure raised by 68% for total sample and by 5.9% to 20% poorest subsample.

Although education expenditures are positive, they are not statistically significant for any strata. This category, however, was not added to another one since this is an important aspect of *Bolsa Família* Program. The higher standard errors for this expenditure and fewer matched observations seems to compromise these models' statistical significance.

Other items effects results are not statistically significant for any strata. Considering households' total consumption, *Bolsa Família* seems to rise, on average, 8.7% to 12.2%, depending on which strata is analyzed.

Table 5 Average treatment effect on the treated (ATT) for listed expenditures

	Total		**40% Poorest**		**20% Poorest**	
Expenditures on	**ATT (Std. Err.)**	**Matched Obs.**	**ATT (Std. Err.)**	**Matched Obs.**	**ATT (Std. Err.)**	**Matched Obs.**
Food	10.8%* (2.2%)	8,483	10.0%* (2.4%)	7,332	10.3%* (3.1%)	4,890
Clothing	5.7%** (2.7%)	7,869	7.3%** (3.0%)	6,786	7.0%*** (4.1%)	4,468
Education	3.4% (3.5%)	6,030	1.6% (3.9%)	5,302	5.0% (4.7%)	3,553
Housing, Transportation, Hygiene and Health Care	6.8%* (1.9%)	8,910	2.6% (2.0%)	7,703	5.9%** (2.7%)	5,148
Other items	3.7% (2.9%)	8,365	1.4% (3.0%)	7,206	2.1% (4.0%)	4,745
Total Expenditures	**12.2%* (1.7%)**	**8,919**	**9.4%* (1.9%)**	**7,712**	**8.7%* (2.3%)**	**5,156**

Source: Author's computation using data from the Household Budget Survey – POF 2008-2009/IBGE.
ATT: Average treatment effect on the treated.
Significance Level: (* 1%) (** 5%) (*** 10%)

Table 6 Standardized differences for matched households

	Matched Standardized Differences																	
	Total						40% Poorest						20% Poorest					
	Food	Clothing	Education	Housing, Transportation, Hygiene and Health Care	Other items	Total Expenditures	Food	Clothing	Education	Housing, Transportation, Hygiene and Health Care	Other items	Total Expenditures	Food	Clothing	Education	Housing, Transportation, Hygiene and Health Care	Other items	Total Expenditures
Households data																		
Located at urban area	-0.05	-0.07	-0.04	-0.03	-0.04	-0.03	0.00	-0.04	0.01	-0.02	-0.03	-0.02	-0.03	-0.04	-0.01	-0.03	0.00	-0.02
External wall made from masonry	0.03	0.00	0.01	0.02	0.04	0.02	0.00	0.03	0.04	0.03	-0.01	0.02	-0.01	-0.02	-0.01	0.03	0.01	0.00
Cover made of tile	0.02	0.00	-0.01	0.03	0.00	0.04	0.00	0.00	-0.04	-0.01	0.01	0.00	-0.03	-0.05	0.03	0.02	0.01	-0.02
Floors made of cement	0.03	-0.03	-0.04	-0.01	0.00	0.01	-0.04	-0.02	-0.01	-0.04	-0.01	-0.01	-0.02	-0.03	0.03	-0.03	-0.03	-0.03
Existence of piped water	-0.02	-0.04	0.00	-0.01	-0.03	-0.03	0.00	0.03	0.01	0.00	-0.01	0.00	-0.02	0.00	0.00	0.02	0.01	-0.04
Connection to sewer network	0.00	-0.02	0.01	0.00	0.00	0.01	0.01	0.00	0.02	0.00	0.02	0.02	0.02	0.01	-0.03	0.00	0.03	-0.02
Paved street	-0.01	0.00	0.01	0.01	0.01	0.01	0.03	0.00	0.03	0.00	0.00	-0.01	-0.01	0.01	-0.01	0.01	0.00	-0.02
Mail is delivered by postman	-0.05	-0.05	-0.02	-0.02	-0.04	-0.03	-0.01	-0.01	-0.01	-0.03	-0.02	-0.03	-0.05	-0.03	0.01	-0.01	0.02	-0.05
Garbage collected daily	-0.05	-0.06	-0.05	-0.01	-0.05	-0.03	-0.01	-0.01	0.00	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02	-0.01	0.00	-0.03
Water heating	-0.02	0.00	0.01	0.01	-0.01	-0.02	0.01	0.03	0.02	0.03	0.04	0.00	0.00	0.01	-0.02	0.03	0.00	0.03
Residents data																		
Income per capita without BF transfers (R$/month)	0.01	0.00	0.01	0.00	-0.02	0.01	-0.02	-0.03	-0.04	-0.02	-0.04	-0.02	-0.04	-0.07	-0.04	0.00	-0.06	-0.03
Number of children until 15 years old	-0.02	0.00	0.04	0.00	-0.04	0.00	0.01	-0.02	-0.03	0.00	-0.01	-0.01	-0.03	-0.03	-0.06	0.00	-0.02	-0.01
Years of education for the consumer unit head	-0.03	-0.04	0.01	-0.03	-0.03	-0.01	0.02	-0.01	0.03	0.00	0.02	0.02	-0.03	0.01	0.02	-0.01	0.03	0.00
Checking account for consumer unit head	0.02	0.00	0.02	0.02	-0.02	0.01	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.00	0.00	0.03	0.05	0.00

Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 7 Variance Ratios for matched households

	Matched Variance Ratios																	
	Total						40% Poorest						20% Poorest					
	Food	Clothing	Education	Housing, Transportation, Hygiene and Health Care	Other items	Total Expenditures	Food	Clothing	Education	Housing, Transportation, Hygiene and Health Care	Other items	Total Expenditures	Food	Clothing	Education	Housing, Transportation, Hygiene and Health Care	Other items	Total Expenditures
Households data																		
Located at urban area	1.04	1.05	1.03	1.02	1.03	1.02	1.00	1.02	0.99	1.01	1.02	1.01	1.01	1.02	1.01	1.01	1.00	1.01
External wall made from masonry	0.96	1.01	0.98	0.96	0.94	0.97	1.00	0.96	0.94	0.95	1.02	0.97	1.01	1.03	1.01	0.97	0.99	1.00
Cover made of tile	0.95	1.00	1.02	0.93	0.99	0.90	0.99	0.99	1.13	1.03	0.98	1.01	1.10	1.14	0.94	0.94	0.98	1.05
Floors made of cement	0.99	1.01	1.01	1.00	1.00	1.00	1.02	1.01	1.00	1.02	1.01	1.00	1.01	1.02	0.99	1.01	1.02	1.01
Existence of piped water	1.02	1.05	1.00	1.02	1.03	1.03	1.00	0.97	0.98	1.00	1.01	1.00	1.02	1.00	1.00	0.99	0.99	1.04
Connection to sewer network	1.00	0.97	1.01	1.00	1.01	1.01	1.03	0.99	1.05	1.00	1.03	1.03	1.04	1.02	0.95	1.01	1.06	0.97
Paved street	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.01	1.00	0.99
Mail is delivered by postman	1.02	1.02	1.01	1.01	1.02	1.01	1.00	1.00	1.00	1.01	1.01	1.01	1.01	1.00	1.00	1.00	1.00	1.01
Garbage collected daily	1.02	1.03	1.02	1.01	1.02	1.01	1.00	1.00	1.00	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Water heating	0.97	1.01	1.01	1.01	0.98	0.98	1.02	1.05	1.03	1.04	1.05	1.00	0.99	1.02	0.96	1.05	0.99	1.05
Residents data																		
Income per capita without BF transfers (R$/month)	0.91	0.95	0.86	0.89	0.96	0.89	0.90	0.96	0.89	0.91	0.89	0.87	0.90	1.04	0.93	0.84	0.97	0.86
Number of children until 15 years old	0.78	0.78	0.91	0.77	0.74	0.78	0.76	0.78	0.79	0.80	0.78	0.80	0.76	0.76	0.73	0.79	0.78	0.78
Years of education for the consumer unit head	0.92	0.93	0.94	0.92	0.90	0.93	0.95	0.96	0.97	0.91	0.97	0.93	0.93	0.95	0.94	0.91	0.98	0.96
Checking account for consumer unit head	1.11	1.02	1.08	1.10	0.92	1.08	1.03	1.01	1.08	1.14	1.11	1.14	1.22	1.02	1.02	1.34	1.68	0.96

Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

5 Conclusions

Conditional cash transfers programs, as *Bolsa Família*, are known as a great way of reducing poverty by transferring income directly to head of families which can decide by themselves how they spend the benefit. On the other hand, some recipients must ensure school attendance for children and teenagers and health checkup in order to continue receiving transfers. This way, the Federal Government helps to alleviate poverty while ensuring human capital formation so that in the next generation these families can leave social vulnerability situations.

Since *Bolsa Família* recipients have full autonomy to spend their benefit, this work aimed to identify through their budget structure, what effects these benefits cause or, in other words, how they spend those payments. Using microdata from the Household Budget Survey POF 2008-2009 published by IGBE with Propensity Score Matching Estimators, *Bolsa Família* recipients were identified as treatment group and compared to the rest of the sample through observed characteristics that identified which families were non-recipients, but were eligible to be. Sensitivity analysis were also made to ensure that models held important assumption, as conditional Independence Hypothesis and common support through treatment and control groups for all propensity scores calculated.

This work main findings were an average increase of 7.6% to 10.3% on total expenditures, depending on which model is being analyzed, total (10.3%), 40% poorest (7.6%) or 20% poorest households (7.9%). Food expenditures rise by 10.5% to 11.4% for BF recipients, on average, followed by clothing expenditures rising by 5.4% to 5.8%, on average. Although education expenses did not show statistical significance, housing, transportation, hygiene and health care group of expenses rise by, on average, 9.6% for total recipients model.

When analyzing these results with the BF aim, it seems that those benefits are being spent efficiently in some level. It ensures poverty alleviation with an increase of households'

consumption. Food expenditures increase, for instance, ensure a better diet for households, in particular children, allowing them to receive more nutrients and have better conditions to study as an incentive for human capital formation.

This work contributes to increase the Bolsa Família Program understanding of how recipient households manage resource allocation of their benefit.

6 References

Abadie, Alberto; Imbens, Guido. 2016. "Matching on the estimated propensity score". *Econometrica*. 84(2): 781-807.

Adato, Michelle; Hoddinott, John. 2007. "Conditional Cash Transfer Programs: A "Magic Bullet" for reducing Poverty?." *2020 Focus Brief on the World's Poor and Hungry People*. Washington, DC: IFPRI.

Barrientos, Armando *et al.* 2016. "Heterogeneity in Bolsa Família outcomes." *The Quarterly Review of Economics and Finance*, 62: 33–40.

Caliendo, Marco; Kopeinig, Sabine. 2008. "Some Practical Guidance for the Implementation of Propensity Score Matching." *Journal of Economic Surveys.* 22(1): 31-72.

Cameron, A. Colin; Trivedi, Prakin K. 2005. *Microeconometrics: Methods and Applications.* New York: Cambridge University Press.

Cerulli, Giovanni. 2015. *Econometric Evaluation of Socio-Economic Programs Theory and Applications*. Springer.

Fiszbein, Ariel *et al.* 2009. *Conditional Cash Transfers: Reducing Present and Future Poverty.* Washington: The World Bank.

Garrido, Melissa M. *et al.* 2014. "Methods for Constructing and Assessing Propensity Scores." *HSR: Health Services Research.* 49(5): 1701-1720.

Instituto Brasileiro de Geografia e Estatística (IBGE). 2011. *Pesquisa de Orçamento Familiar (POF): 2008-2009: Análise do consumo alimentar pessoal no Brasil.* Rio de Janeiro: IBGE.

Jones, Hayley. 2016. “More Education, Better Jobs? A Critical Review of CCTs and Brazil’s Bolsa Família Programme for Long-Term Poverty Reduction.” *Social Policy & Society*. 15:3: 465-478.

Martins, Ana Paula; Monteiro, Carlos. 2016. “Impact of the Bolsa Família program on food availability of low-income Brazilian families: a quasi-experimental study”. *BMC Public Health*. 16:827

MDS, Ministério do Desenvolvimento Social. 2017. Accessed June 14. http://mds.gov.br/assuntos/bolsa-familia/o-que-e/beneficios.

Oliveira, Ana Maria H. C. *et al.* 2007. “First Results of a Preliminary Evaluation of the Bolsa Família Program.” In: *Evaluation of MDS Policies and Programs – Results Volume 2 – Bolsa Família Program and Social Assistance,* ed. Jeni Vaitsman; Rômulo Paes-Sousa, 19-64, Brasília: Cromos Editora e Indústria Gráfica Ltda.

Resende, Anne C. C.; Oliveira, Ana M. H. C. de. 2008. “Avaliando Resultados de um Programa de Transferência de Renda: o Impacto do Bolsa-Escola sobre os Gastos das Famílias Brasileiras.” *EST. ECON.* 38(2): 235-265.

Rosembaum, Paul R.; Rubin, Donald B. 1983. “The Central Role of the Propensity Score in Observational Studies for Causal Effects.” *Biometrika.* 70(1): 41-55.

Senna, Mônica de C. M.; Brandão, André A.; Dalt, Salete da. 2016. “Programa Bolsa Família e o acompanhamento das condicionalidades na área de saúde.” *Serviço Social & Sociedade.* 1: 148-166.

Soares, Sergei *et al.* 2009. “Conditional Cash Transfers in Brazil, Chile and Mexico: Impacts upon Inequality.” *Estudios Económicos.* Extraordinário: 207-224.

Soares, Fábio V. *et al.* 2010. “Evaluating the Impact of Brazil's Bolsa Família: Cash Transfer Programs in Comparative Perspective.” *Latin American Research Review.* 45(2): 173-190.

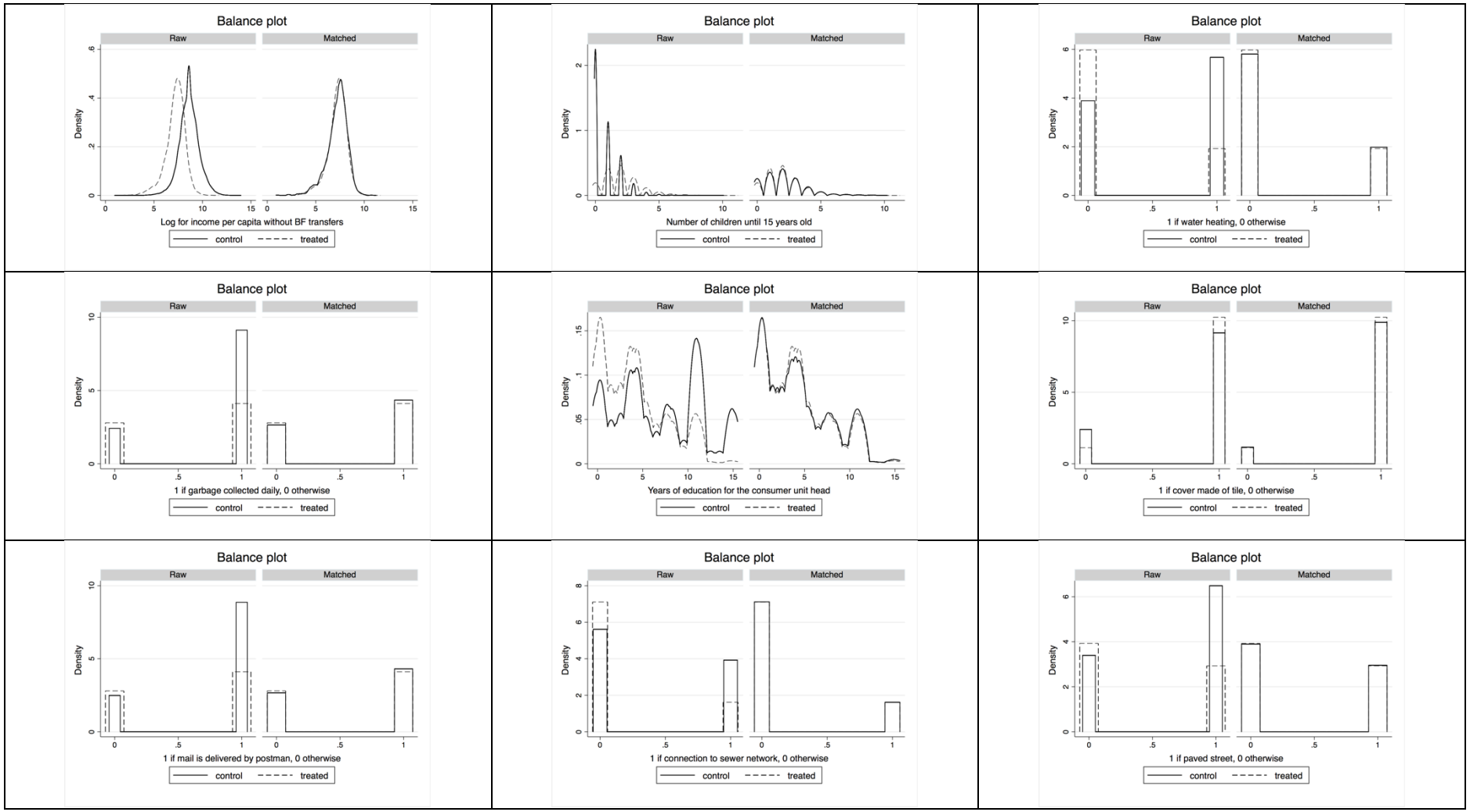
Sperandio, Naiara *et al.* 2017. “Impacto do Programa Bolsa Família no Consumo de Alimentos: Estudo Comparativo das Regiões Sudeste e Nordeste do Brasil.” *Ciência & Saúde Coletiva*. Rio de Janeiro. 22(6): 1771-1780.

Stampini, Marco; Tornarolli, Leopoldo. 2012. “The Growth of Conditional Cash Transfers in Latin America and Caribbean: Did They Go Too Far?.” IZA Discussion Paper n. 49.

The World Bank. 2016. *Taking on Inequality.* Washington: The World Bank Publications.

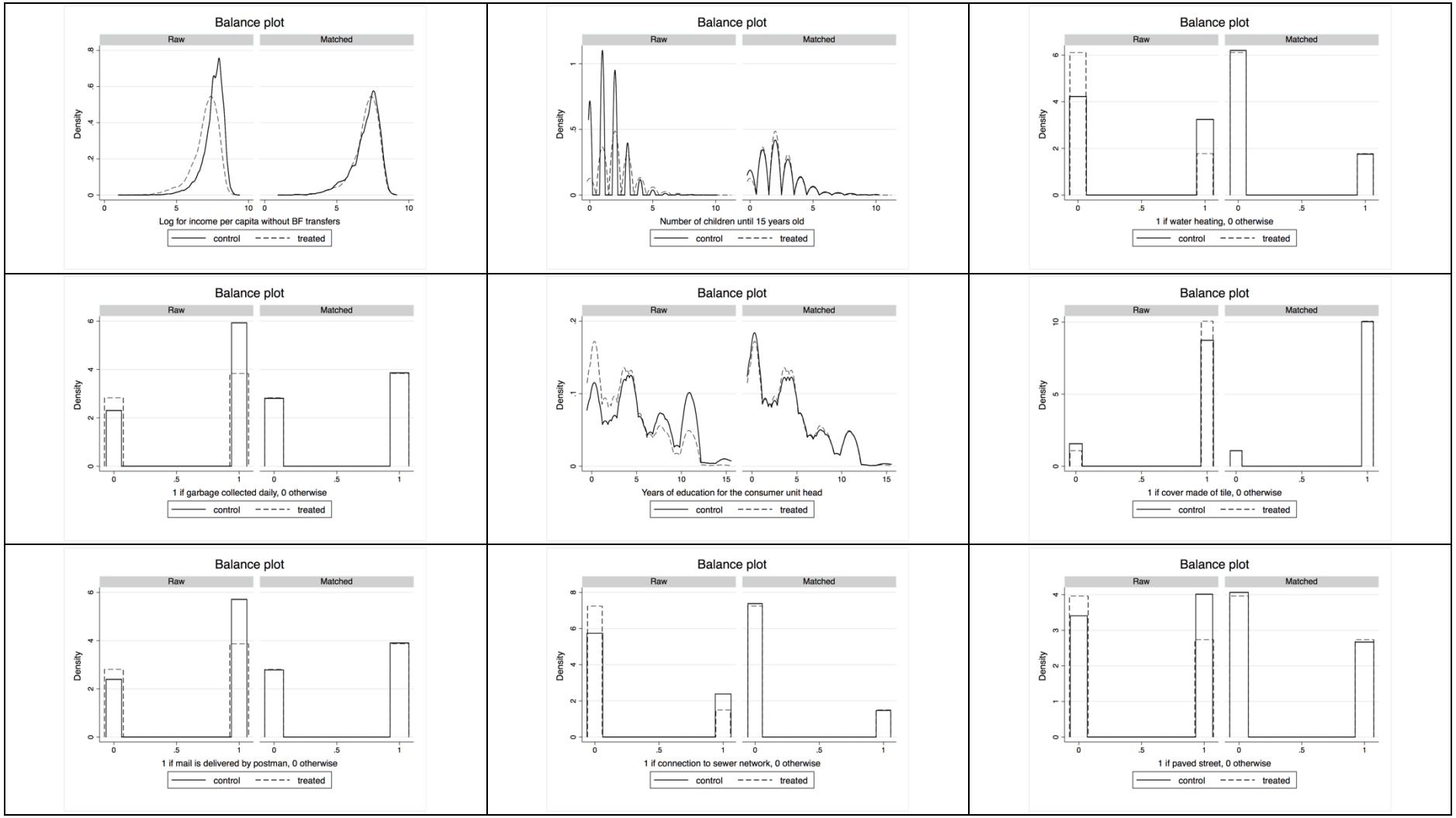
Appendix

Table 8 Balance tests for food expenditures, total sample. Selected covariates.



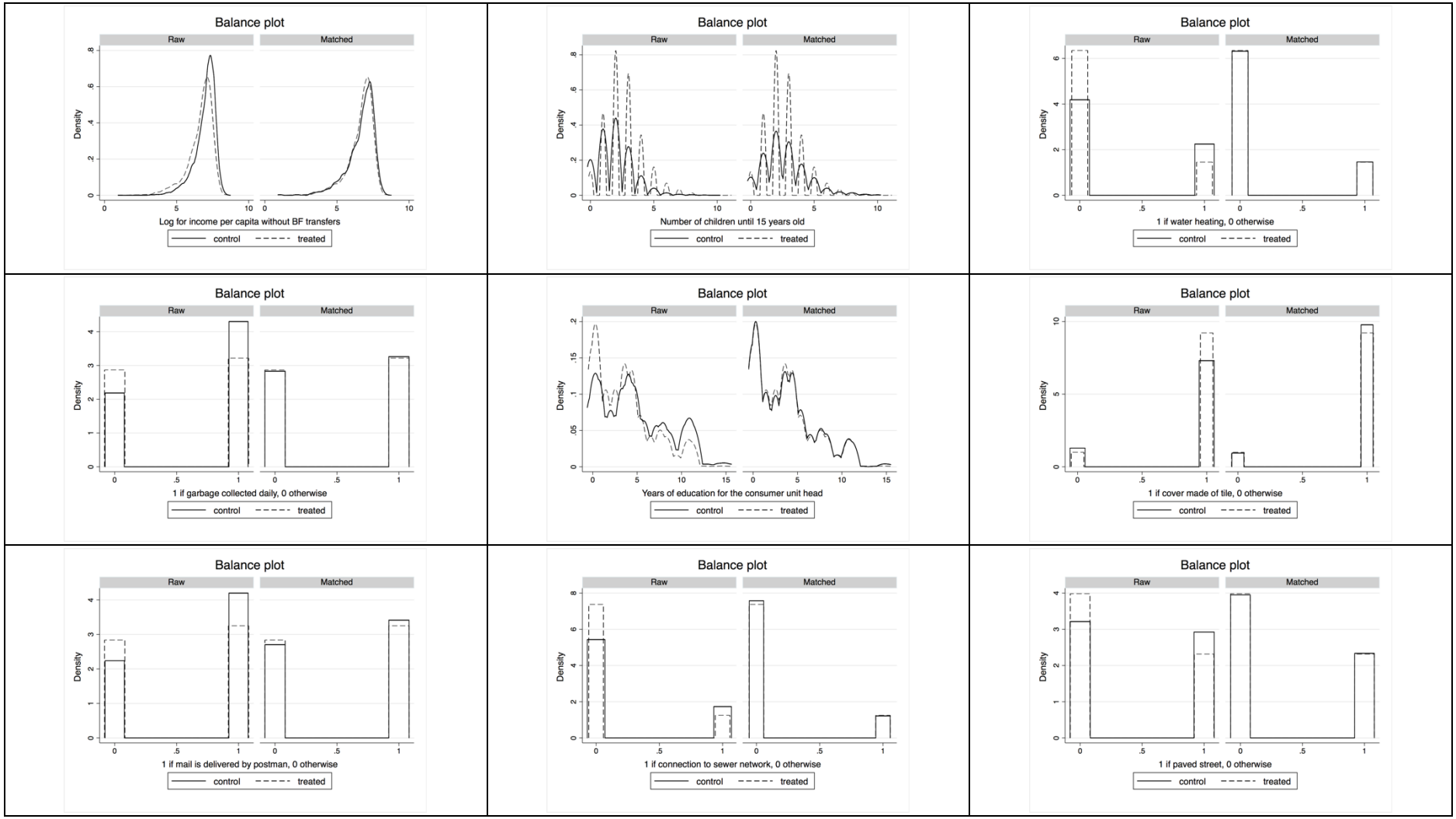
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 9 Balance tests for food expenditures, 40% poorest sample. Selected covariates.



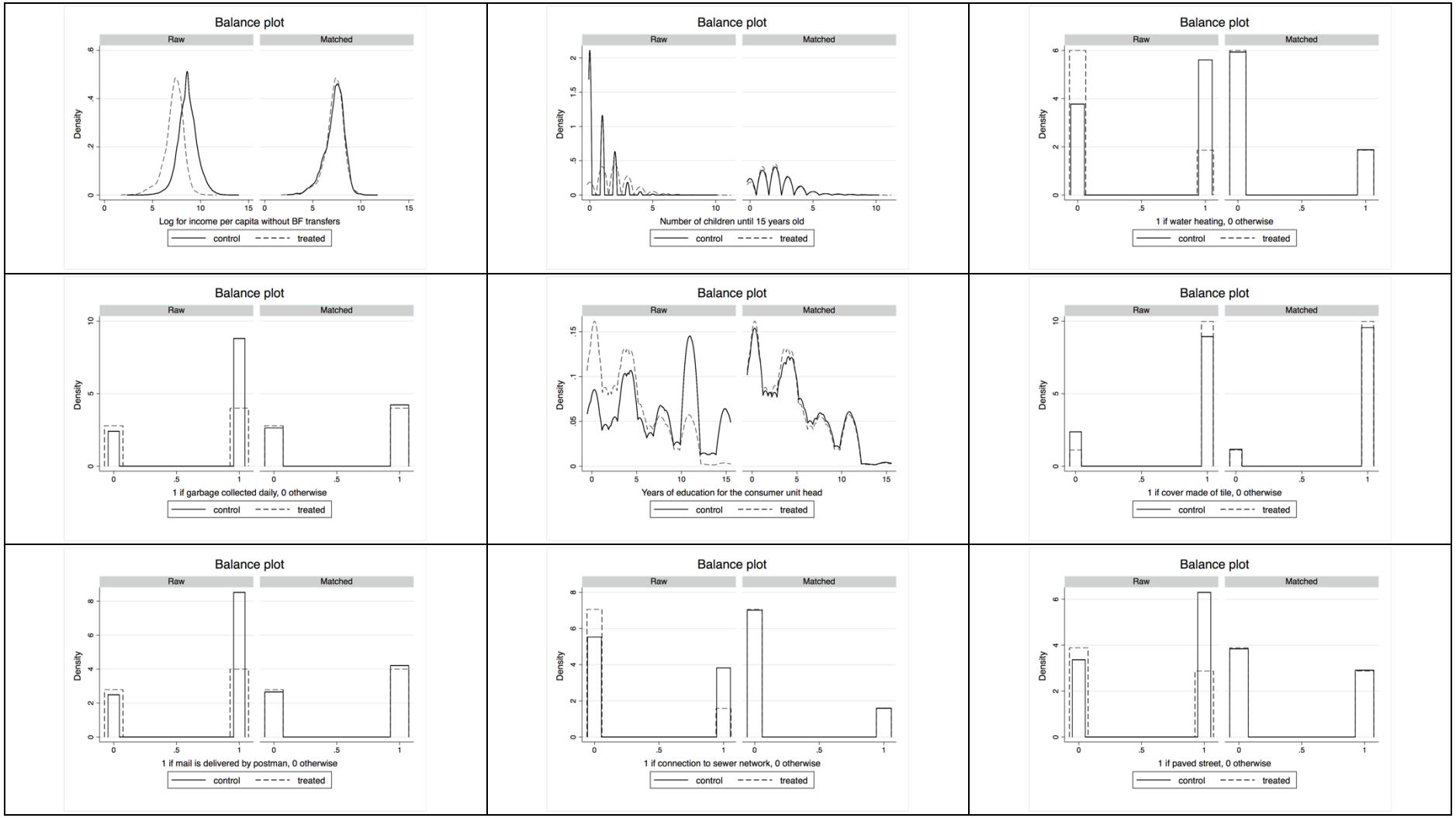
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 10 Balance tests for food expenditures, 20% poorest sample. Selected covariates.



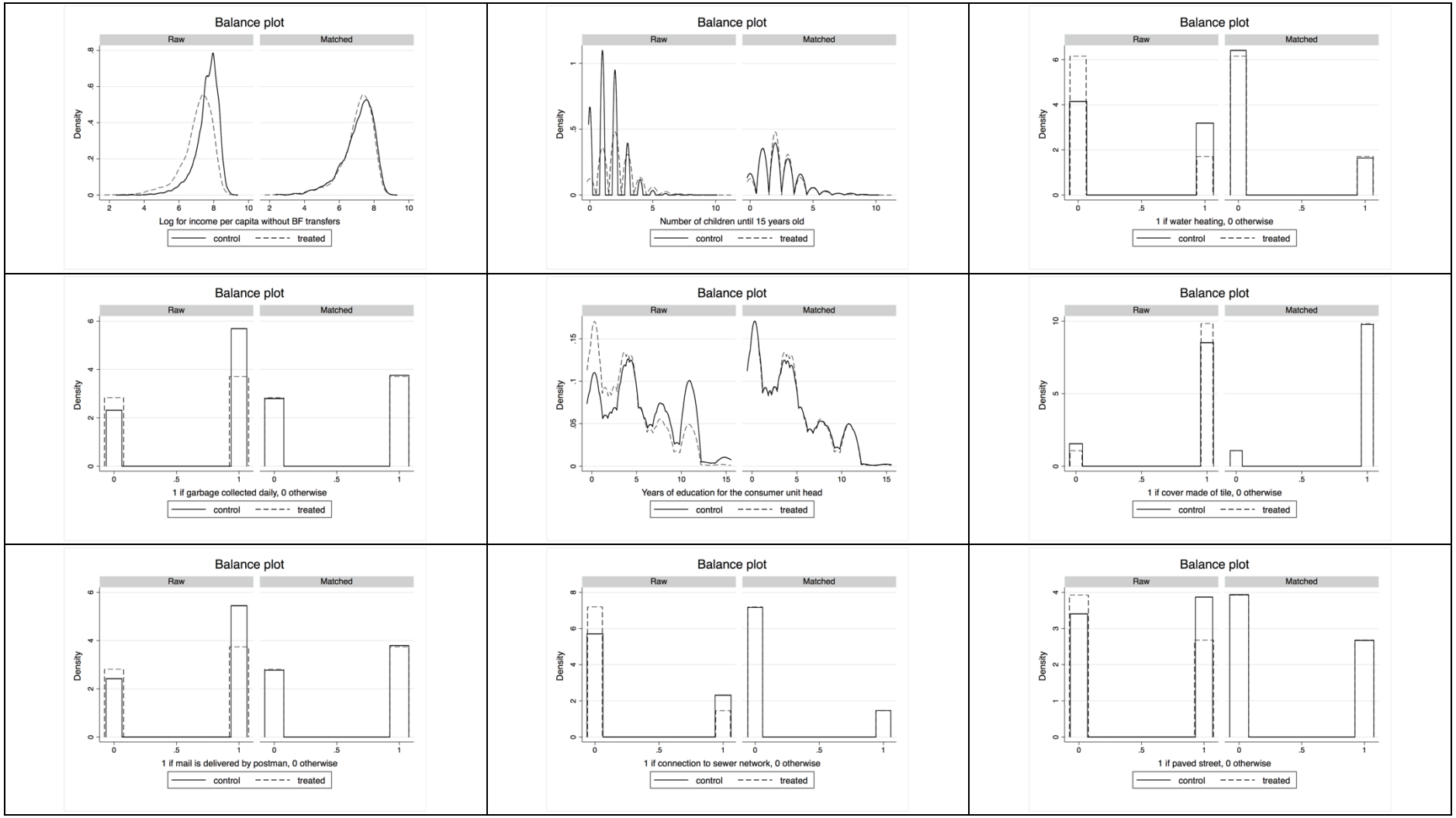
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 11 Balance tests for clothing expenditures, total sample. Selected covariates.



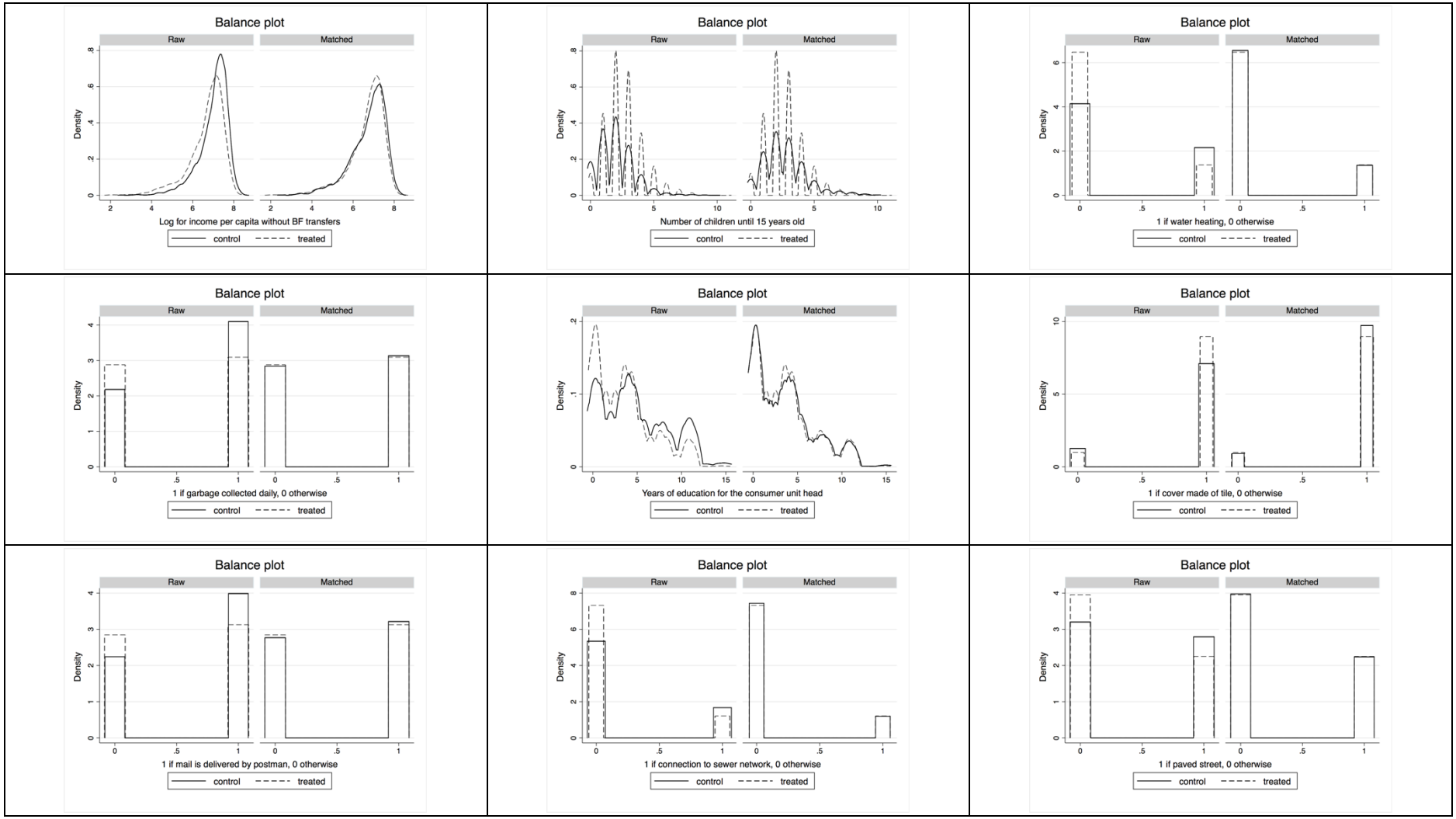
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 12 Balance tests for clothing expenditures, 40% poorest subsample. Selected covariates.



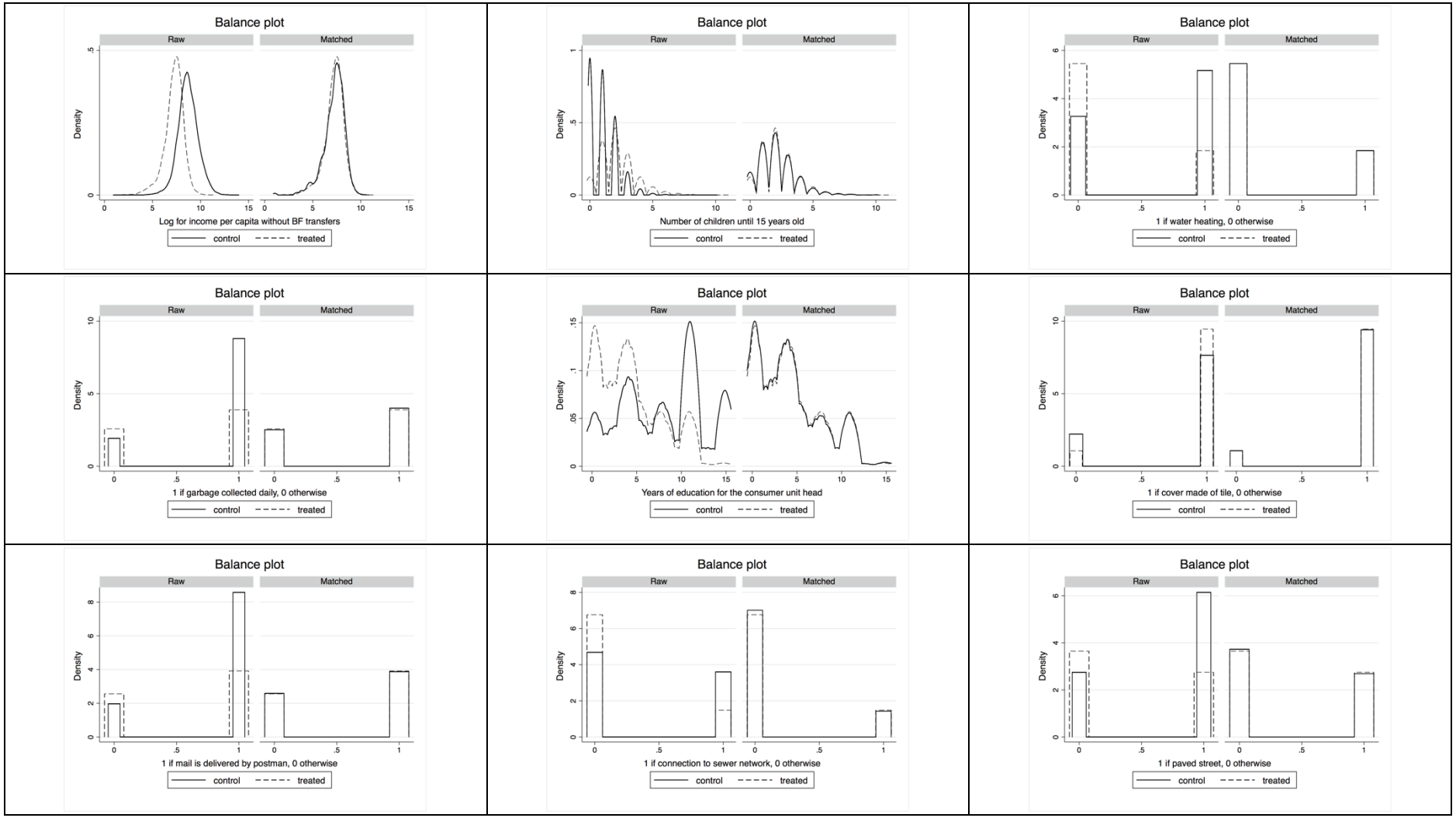
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 13 Balance tests for clothing expenditures, 20% poorest subsample. Selected covariates.



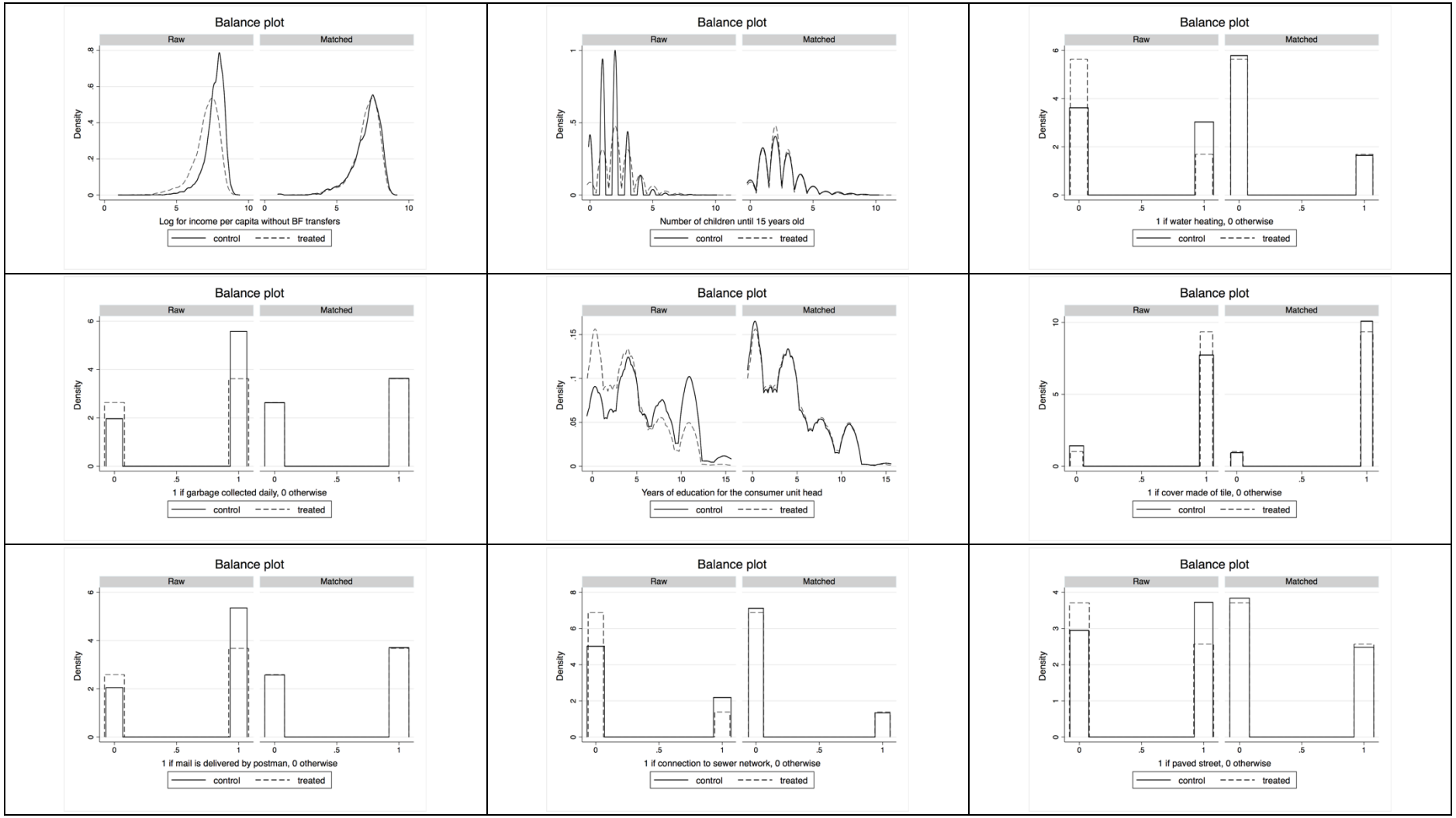
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 14 Balance tests for education expenditures, total sample. Selected covariates.



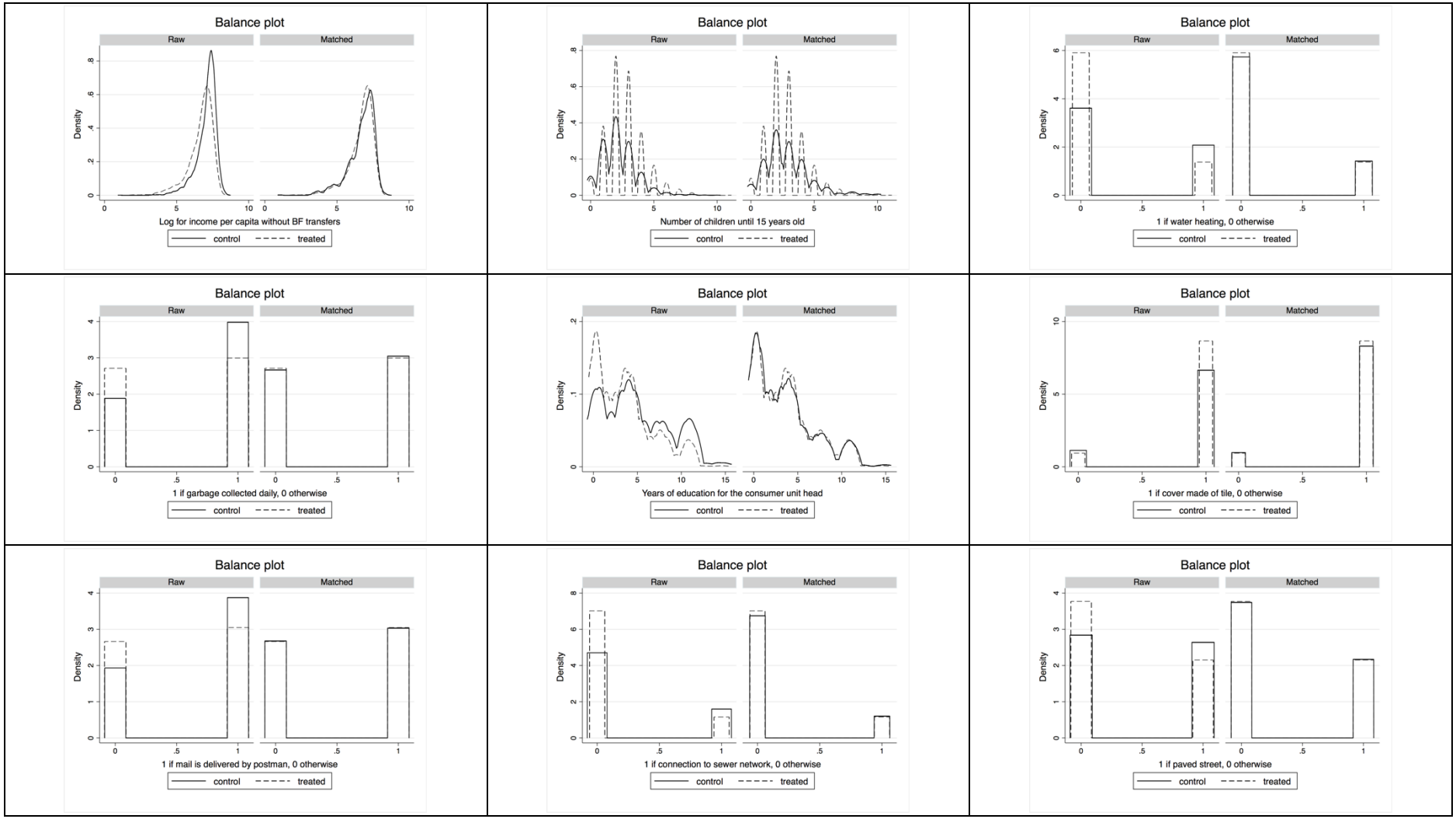
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 15 Balance tests for education expenditures, 40% poorest subsample. Selected covariates.



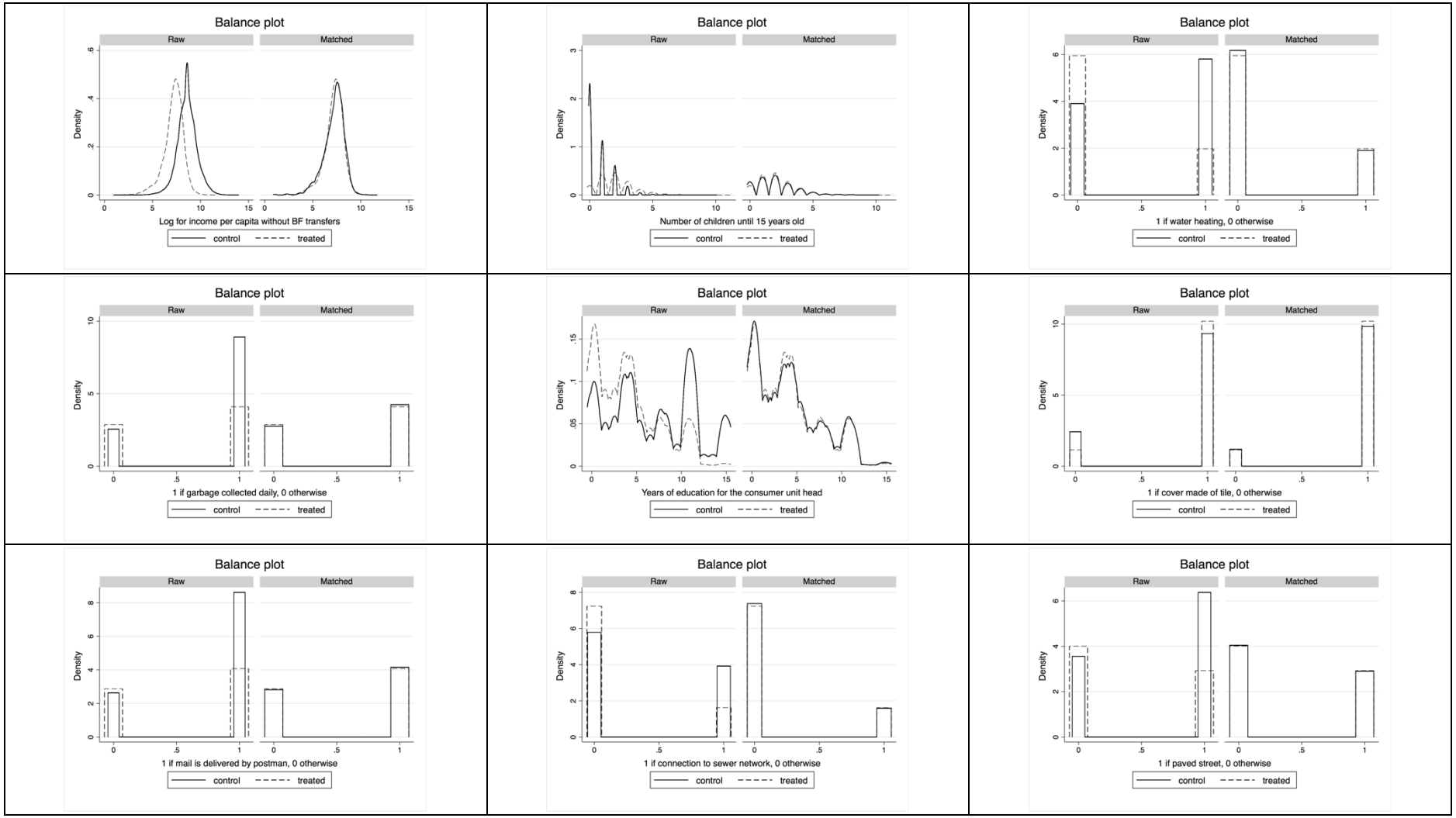
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 16 Balance tests for education expenditures, 20% poorest subsample. Selected covariates.



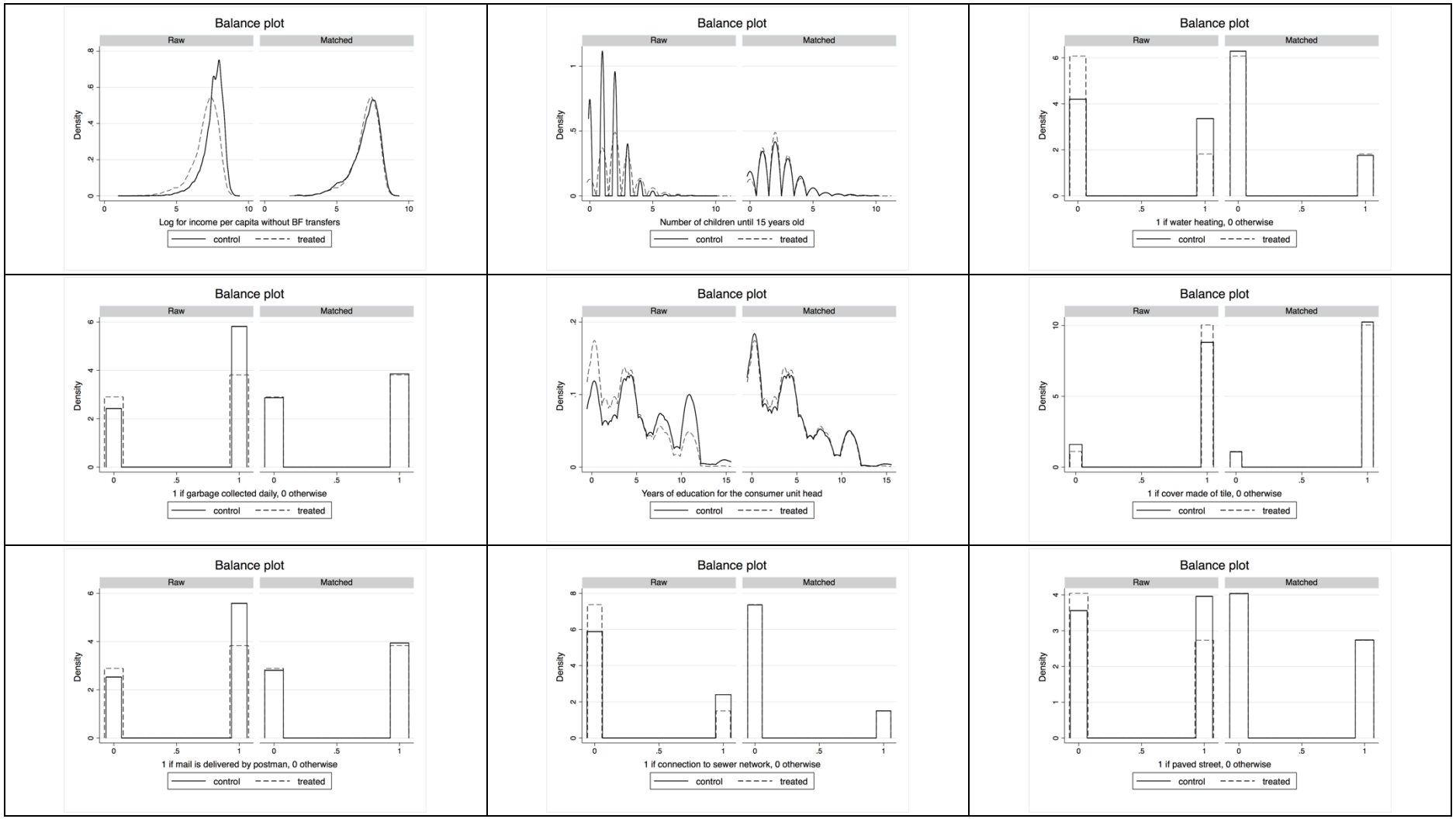
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 17 Balance tests for housing, transportation, hygiene and health care expenditures, total sample. Selected covariates.



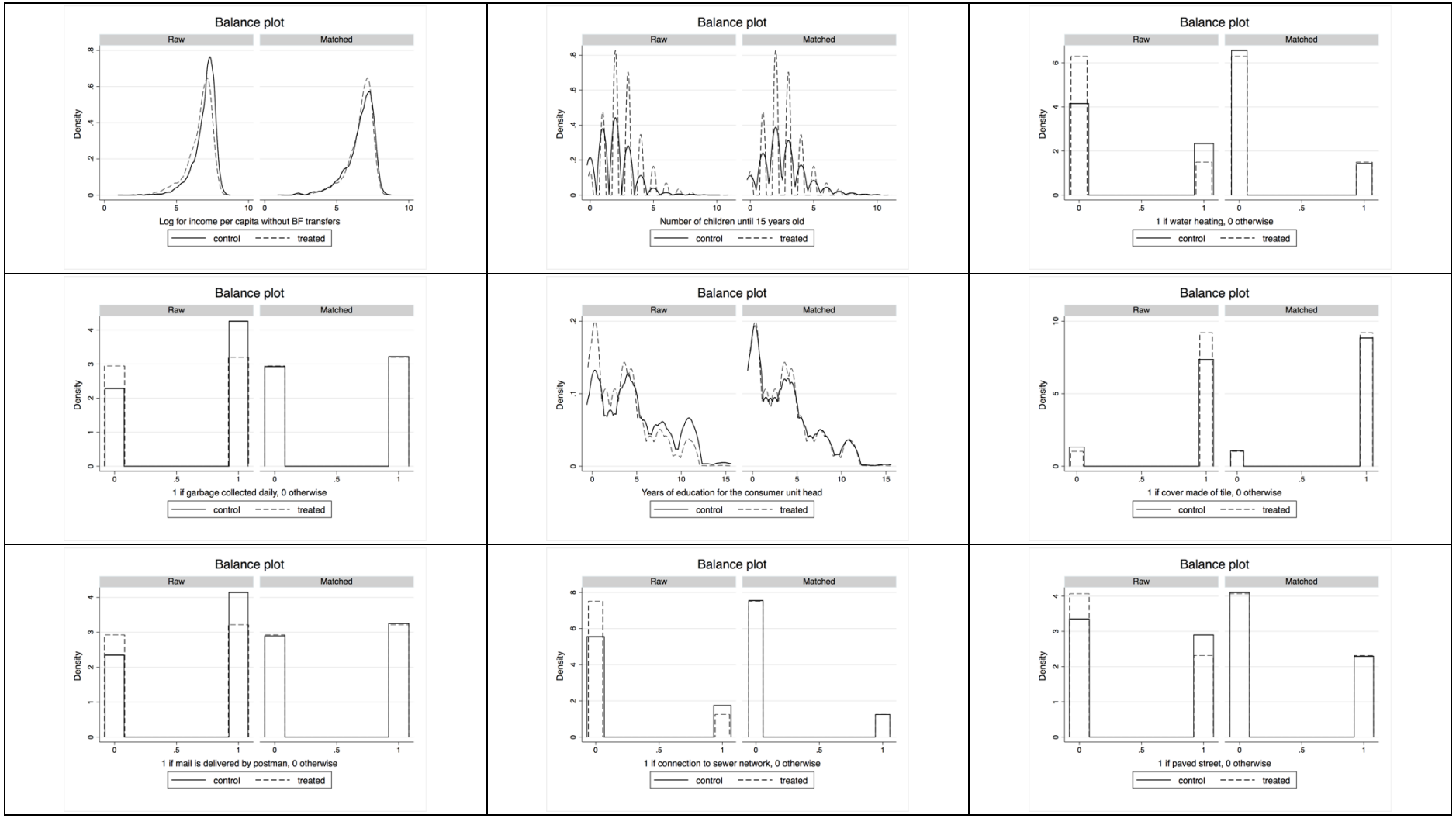
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 18 Balance tests for housing, transportation, hygiene and health care expenditures, 40% poorest subsample. Selected covariates.



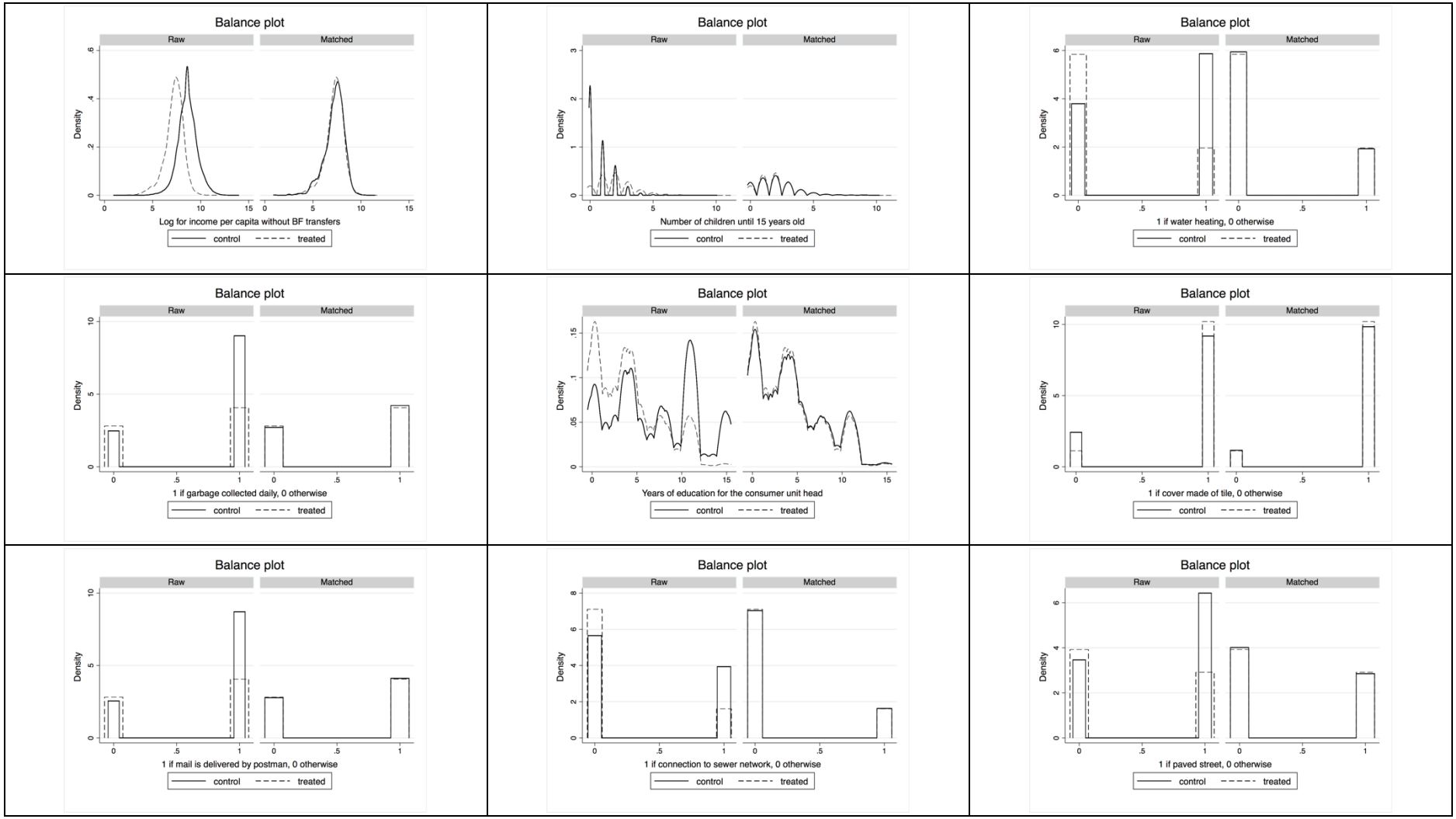
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 19 Balance tests for housing, transportation, hygiene and health care expenditures, 20% poorest subsample. Selected covariates.



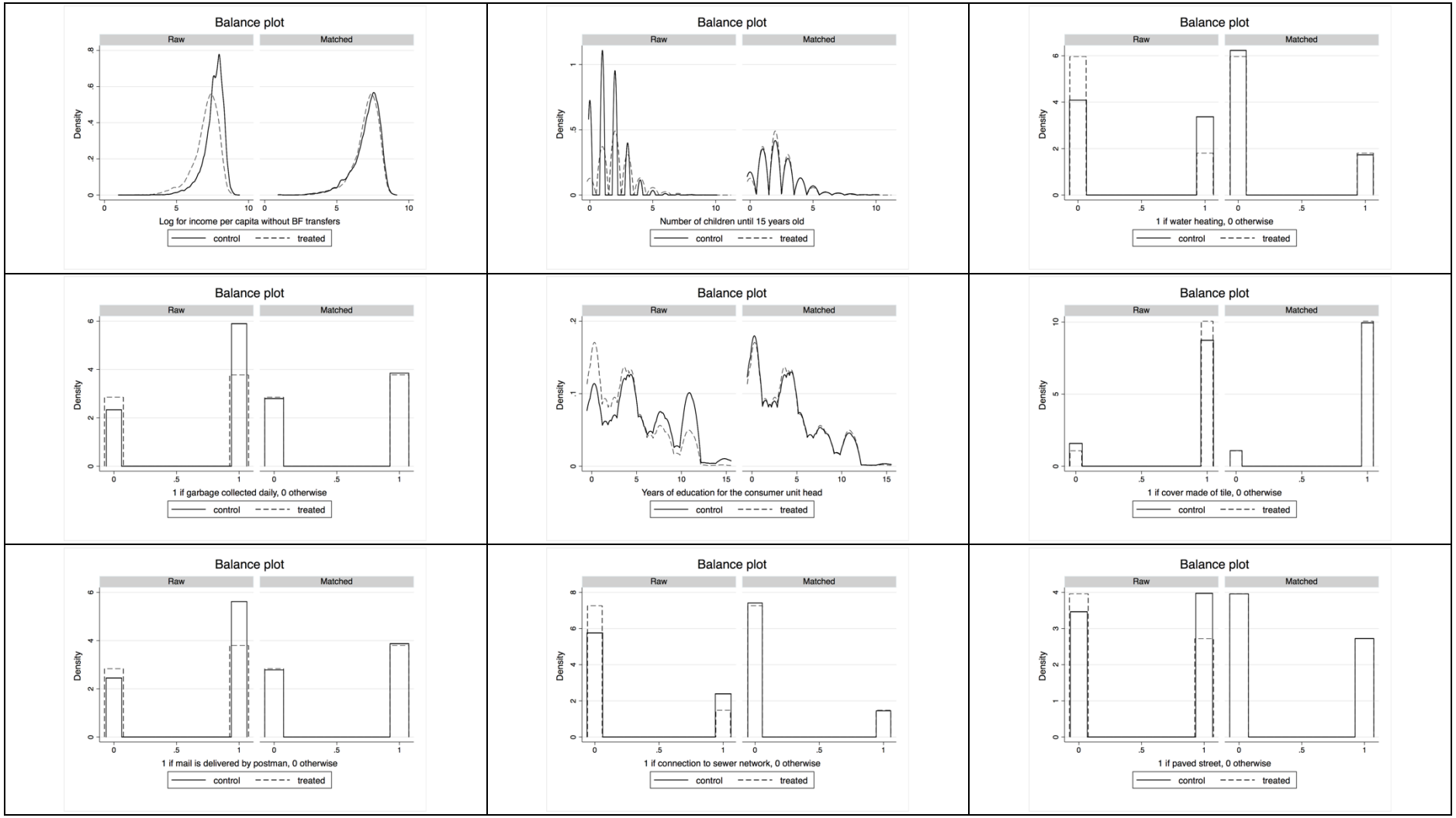
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 20 Balance tests for other expenditures, total sample. Selected covariates.



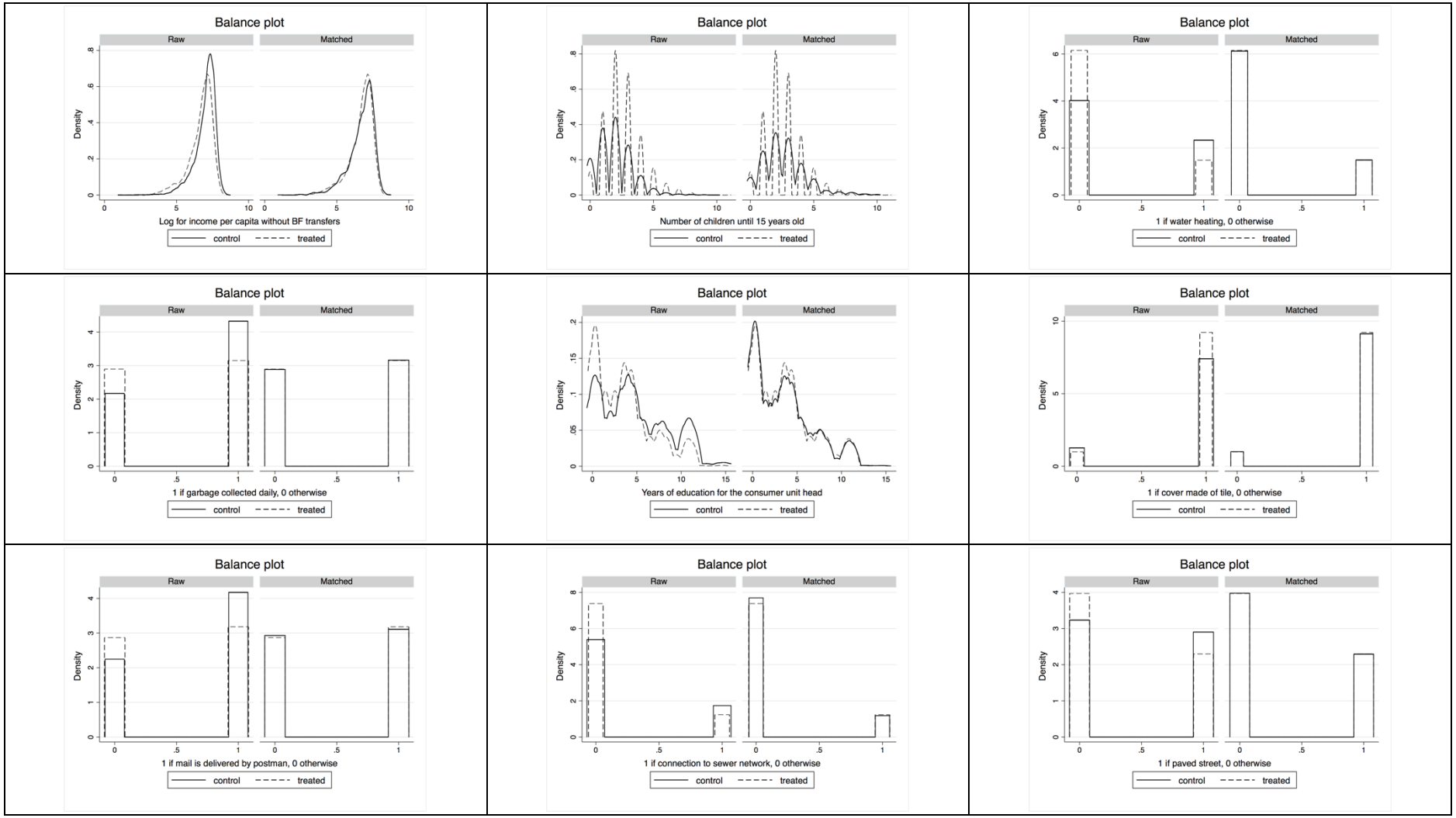
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 21 Balance tests for other expenditures, 40% poorest subsample. Selected covariates.



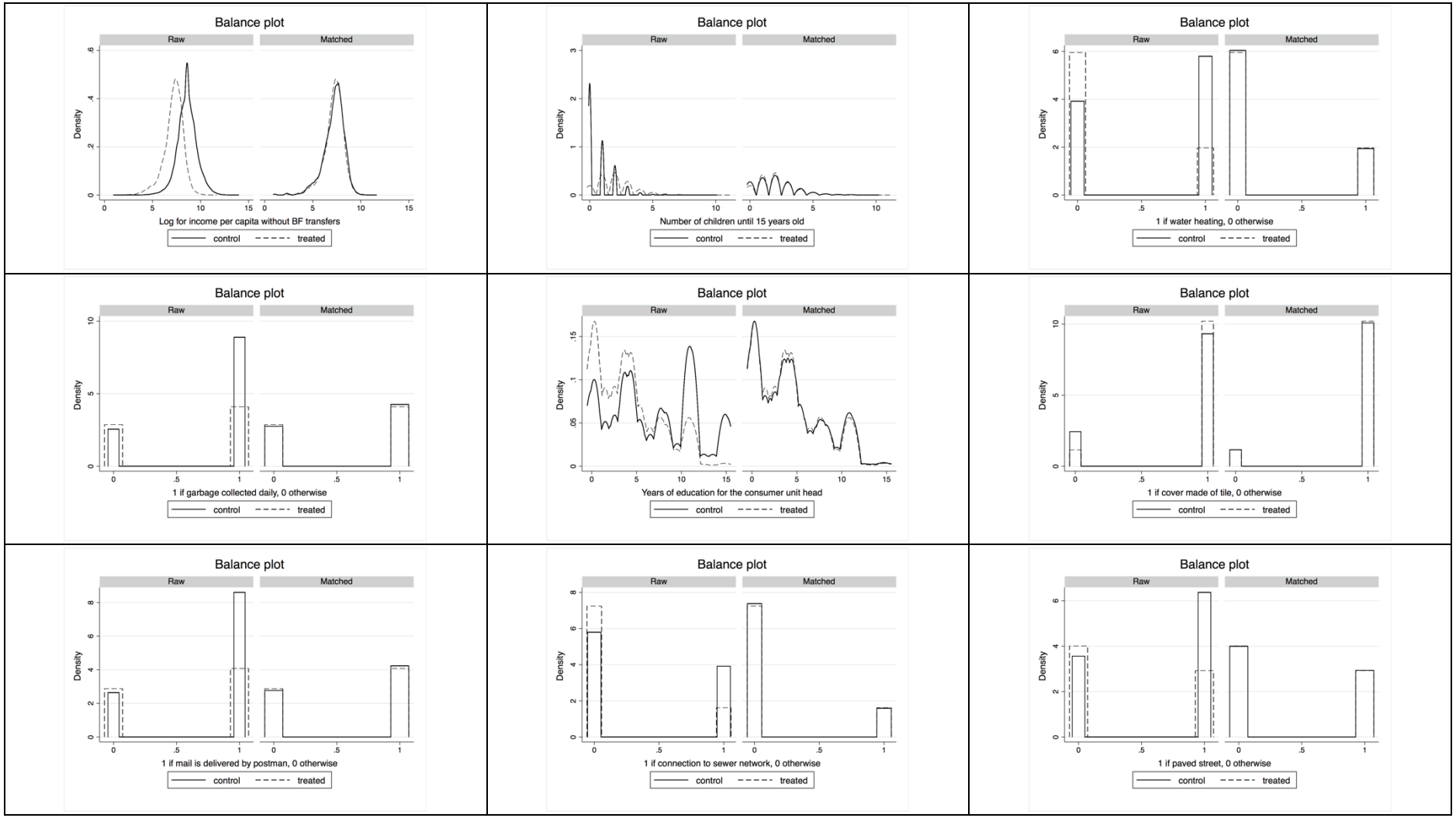
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 22 Balance tests for other expenditures, 20% poorest subsample. Selected covariates.



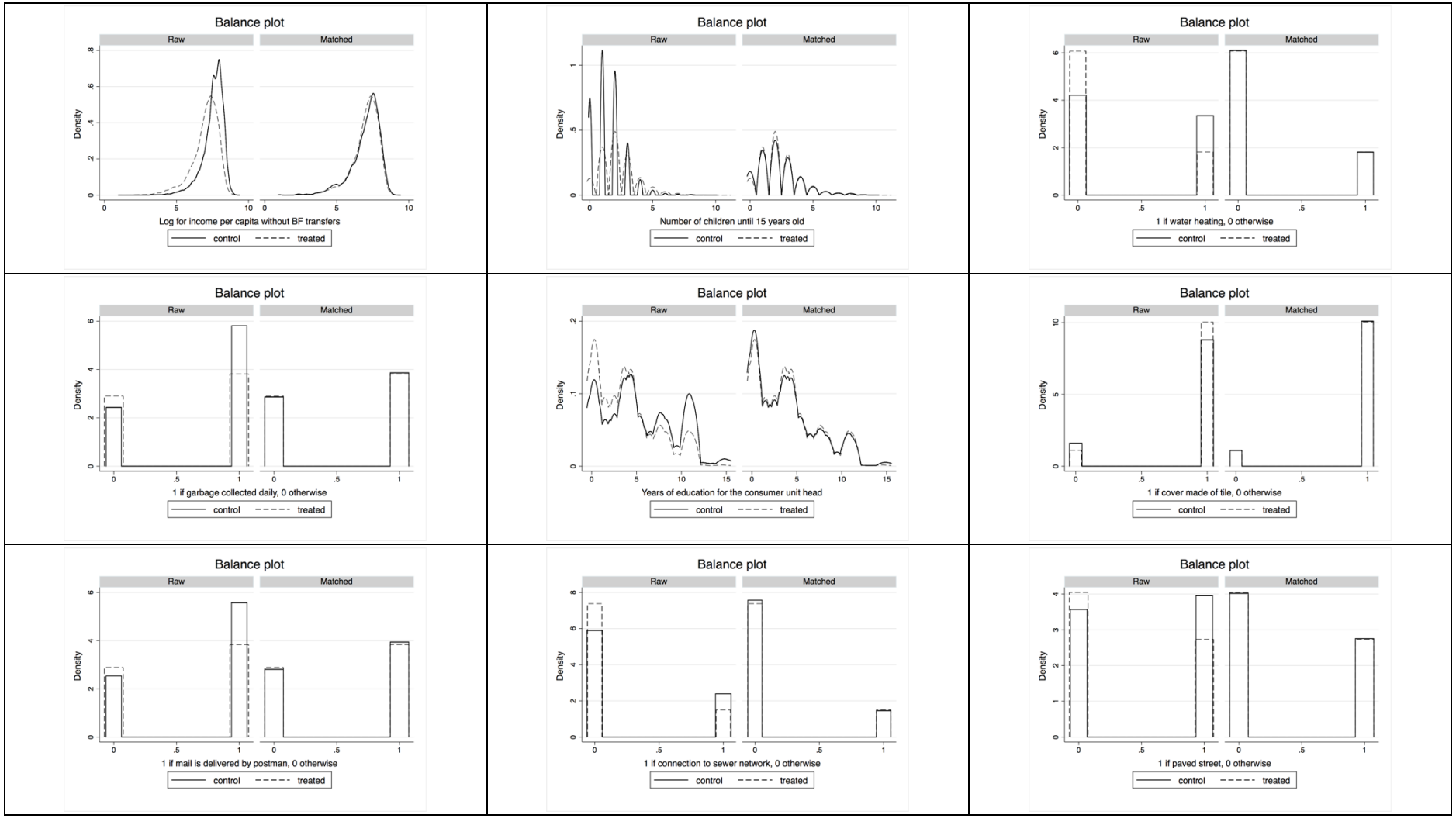
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 23 Balance tests for total expenditures, total sample. Selected covariates.



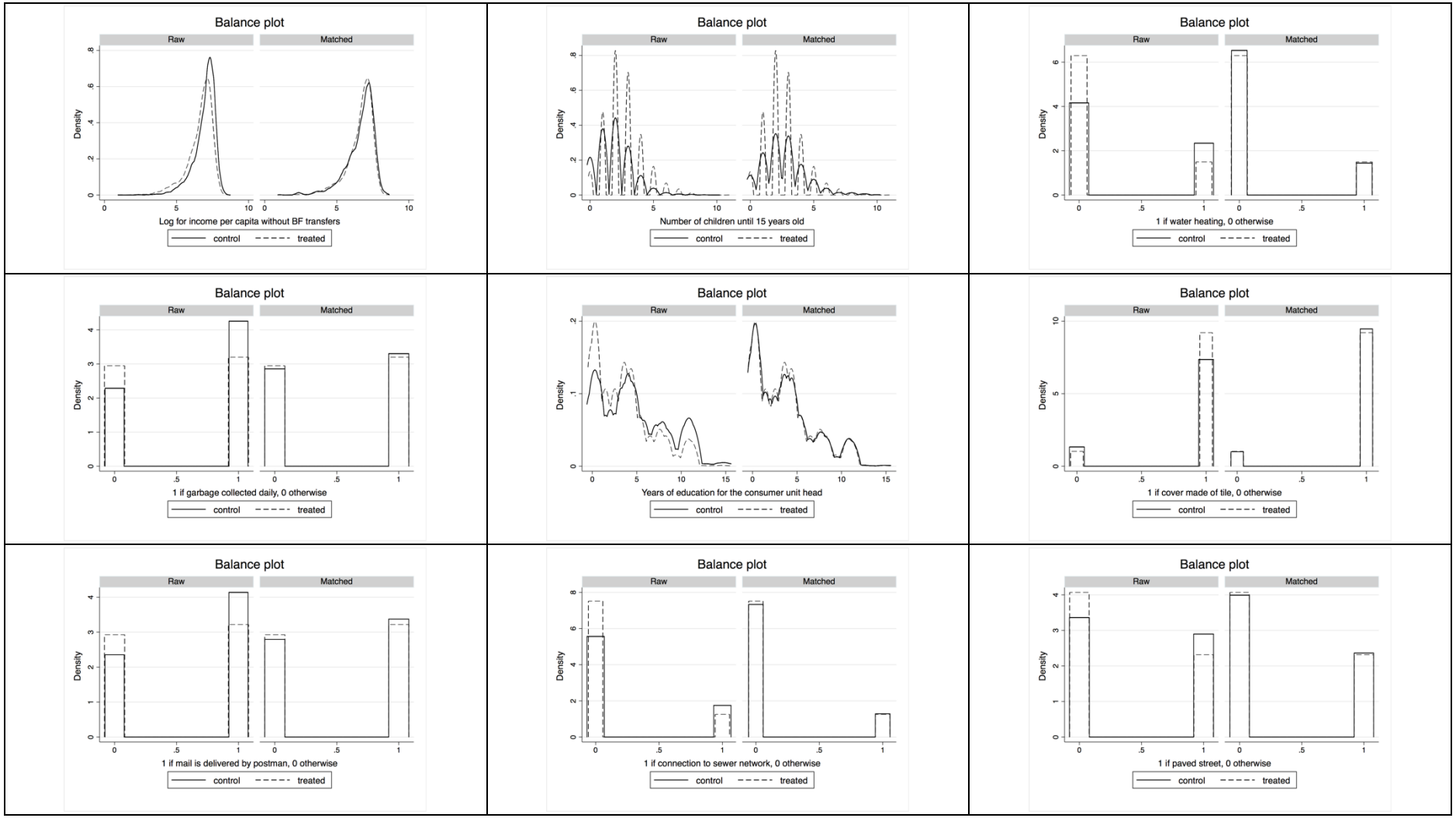
Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 24 Balance tests for total expenditures, 40% poorest subsample. Selected covariates.



Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.

Table 25 Balance tests for total expenditures, 20% poorest subsample. Selected covariates.



Source: Author's computations using data from the Household Budget Survey – POF 2008-2009/IBGE.